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ANNALS *of* SURGERY

VOL. LXIV SEPTEMBER, 1916 No. 3

TUMORS OF THE CAROTID BODY*

BY RANDOLPH WINSLOW, M.D.

OF BALTIMORE, MARYLAND

THE occurrence of tumors of the carotid ganglion is of sufficient infrequency not only to justify but to make desirable the recording of all such cases. I therefore desire to place on record two cases that have come under the observation of my colleague, Dr. Arthur M. Shipley, and myself, respectively.

CASE I.—A young woman, aged sixteen years, had on the right side of her neck a hard lump the size of a hen's egg, deeply seated, and about opposite the hyoid bone. It presented just in front of the anterior margin of the sternocleidomastoid muscle. It was slightly movable from side to side, but not movable in the vertical direction. Its position was so deep that it seemed to be in very close relationship to the transverse processes of the cervical vertebræ. The patient had suffered no inconvenience from the mass, there were no symptoms, and the reason she came for operation was the presence of a growing lump in her neck that she had only noticed for about two months. Examination showed no evidence of pressure upon either the pneumogastric, hypoglossal, or recurrent laryngeal nerves. The lump was single and the most careful palpation failed to reveal the presence of other masses in the neck. Because it was so firm, so fixed, single, and so deeply seated it was thought to be a sarcoma, and a diagnosis of carotid tumor was not made before operation, which was done November 30, 1910.

Under ether anæsthesia an incision was made by Dr. Shipley along the anterior margin of the sternomastoid muscle, and the lump isolated. It was found to be firm in consistency, not attached to the vertebræ, and after careful dissection it was seen that the common carotid artery tunneled the growth. The internal jugular vein was firmly incorporated in the mass, but the pneumogastric

* Read before the American Surgical Association, May 11, 1916.

nerve was not seen. The growth could not be removed without the removal of the entire carotid sheath; so the common carotid artery and internal jugular vein were ligated above and below the growth and the mass lifted out. Almost immediately after the proximal ligature was applied the anæsthetist noticed a marked change in the character of the pulse. Up to this time the patient had been taking a quiet anæsthetic, with a good pulse. The pulse immediately became very fast, but was still regular. The operation was hastily concluded. The wound was sutured without drainage, and the patient returned to bed with a pulse around 160. The pulse did not improve, continued rapid, and, indeed, at times, was above 180. It was regular, however, and of fair volume. This rapid pulse continued four days, but during this time the appearance of the patient was good. In spite of the rapid pulse she had very little discomfort, no dyspnœa, and no cyanosis. The only treatment during this time was an ice-bag over the heart and hypodermic doses of morphine. After four days of this rapid pulse the patient was given strychnine nitrate, gr. $\frac{1}{30}$, hypodermically. Within a few hours from the beginning of the administration of the strychnine the pulse rapidly improved, and on the morning of the fifth day was 100. This patient made an otherwise uninterrupted recovery, and recently, after a lapse of four years, returned to the hospital with a chronically inflamed appendix, which was removed. At this time there was no evidence of recurrence. (The notes of this case were kindly furnished by Dr. Shipley.)

Case II.—L. L. S., white, male, aged twenty-four years, was admitted to University Hospital, Baltimore, on April 20, 1914, and was discharged on May 8, 1914. He complains of a " swollen gland on the left side of the neck." His family history is absolutely good and his personal history not important. His habits are good and he does not use alcohol or tobacco.

About eight years ago he noticed a small lump on the left side of the neck, which has gradually enlarged until it is now the size of a small hen's egg. This tumor is single, smooth, hard, somewhat movable, but also fixed. It is not painful, but on deep pressure tenderness is elicited. The surrounding tissues are not thickened. The tumor is situated in the upper carotid triangle on the left side. There is no aphonia, but occasionally some hoarseness. No pulsation or bruit was noted, and the circulatory system was not abnormal. He had a discharging ear five years ago and has lost some flesh in the last six months. The lungs, heart, and other viscera seem to be in a normal condition.

On admission his temperature, pulse, and respiration were practically normal, as was also the urine.

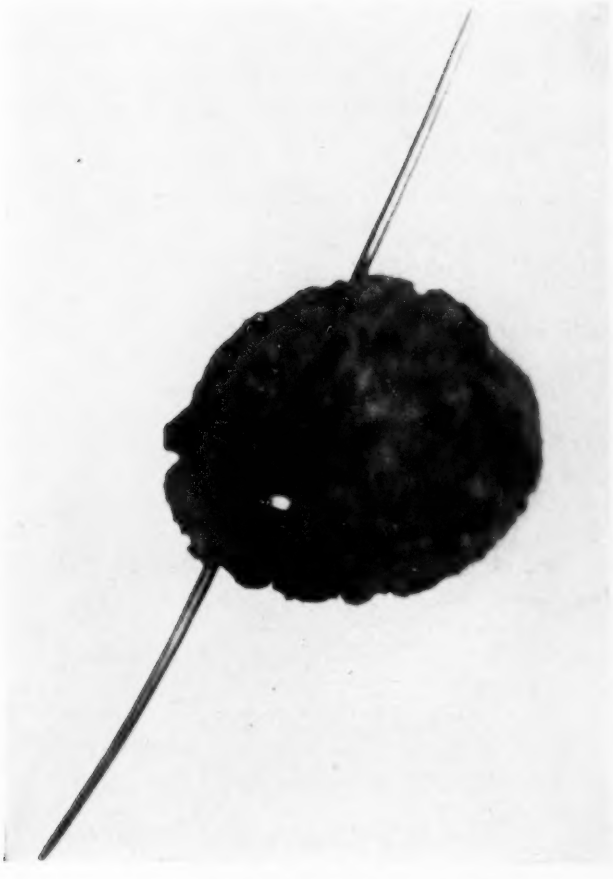

FIG. 1.—Gross appearance of carotid tumor.

FIG. 2.—Section of carotid tumor (x65).

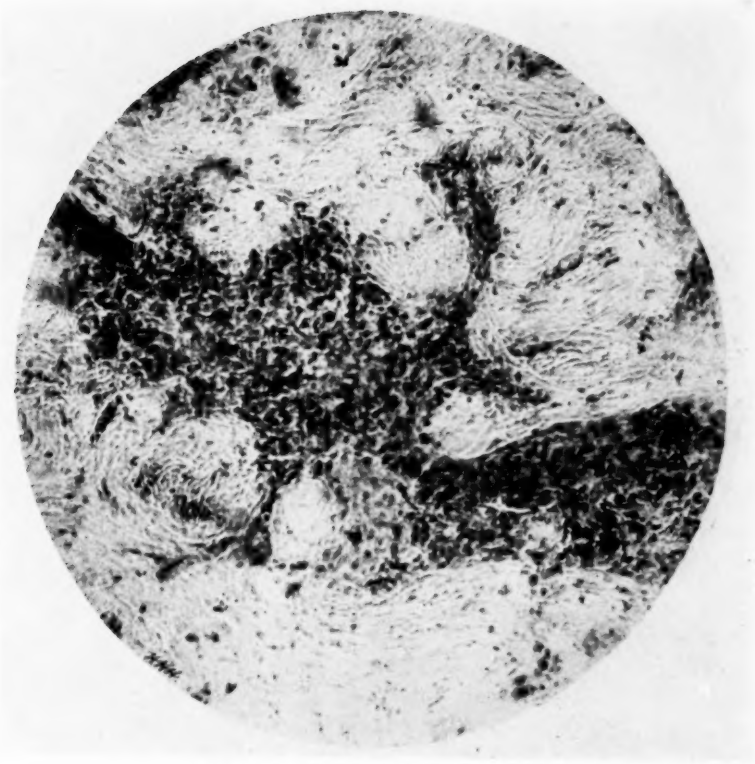

FIG. 3.—Section of carotid tumor (x145).

This tumor was unlike any that I had ever seen, and I expressed the opinion that it might be a growth of the carotid gland.

Operation (April 20, 1914).—Ether anæsthesia. An incision was made along the anterior border of the sternomastoid muscle and the tumor exposed, but it was found impossible to remove it until the carotid vessels were ligated below and above the growth. The artery ran through the mass. The pneumogastric nerve was not seen, but it is probable that the recurrent laryngeal was injured. The patient did well and his temperature chart was scarcely above normal subsequently. There was, however, marked alteration in his voice and some inequality of the pupils, which was still present when he was discharged on May 8.

There was no effect apparent on the pulse or respiration when the artery was tied. Apparently the external carotid was absent or had a high origin, as it was not seen during the operation, and nothing resembling it was ligated.

This patient was heard from in December, 1915, and he expressed himself as being well, but still had an impairment of voice.

Pathological Report on Carotid Tumor.—The tumor is the size of a small egg, measuring 4.4 x 3 x 2.9 cm., weight 17 gms. It has a definite tendency to lobulation and a fibrous capsule. It is irregular in outline, somewhat elastic, fairly dense in consistency, and reddish in appearance. Running obliquely through the tumor, near the periphery, is an artery which permits a small goose-quill to pass through. Radiating over the surface are many small blood-vessels, some of which enter the tumor.

The tumor on section is of reddish gray color, with enough mixture of colors to give it a varied appearance. There seems to be an indistinct arrangement of connective tissue running from the capsule, more or less toward the centre of the mass; the texture and structure between these bands of tissue is of a deeper reddish tint, and is softer in consistency.

Microscopic Examination.—Sections including the capsule show it is fibrous in character and that it radiates toward the inner part of the tumor. The majority of cells of the connective tissues are mostly of the elongated variety with indistinct nuclei, and many cells show nuclei of a vesicular character. Other sections of the tumor show a marked increase in the connective tissue with practically nothing but the elongated or spindle-cell present. All sections of the tumor show a large number of small blood-vessels, which, however, are not typical in structure, some occurring simply as blood spaces.

Some of the vessels show beginning hyaline degeneration. The cells are arranged into groups of large and small aggregations and also occur as columns. In different parts may also be seen irregular, small, isolated groups of cells. An alveolar arrangement is also seen in some of the sections. Innumerable spaces, long and short, broad and narrow, contain multiple layers of cells. In some places these spaces seem to be greatly

dilated and are almost entirely filled with cells. All the cellular elements are separated by considerable fibrous connective tissue.

The cells vary in size and shape, and for the most part are irregular polyhedric in outline. The nuclei likewise vary in size, shape, and staining properties. For the most part they are centrally located and surrounded by a fair amount of protoplasm, which is slightly granular. A distinct nucleolus may be seen in some of the cells.

No definite mitotic figures can be distinctly made out.

It is very difficult to be absolutely certain in making the diagnosis of this tumor, and this seems particularly true of the carotid tumors in general. I sent sections to the heads of several pathological departments of the best medical schools and hospitals in the country, and various diagnoses were made. In several instances they would not commit themselves, but rested upon saying "carotid tumor." The following diagnoses of the sections I sent were suggested: "Perithelioma"; "endothelioma"; "sarcoma"; "carcinoma." I believe it to be an endothelioma.

HOWARD J. MALDEIS,
Pathologist, University Hospital.

These two cases do not differ materially from those that have been reported hitherto, except that the growth in Case I had only been noticed for two months previous to operation, which would suggest a malignant process. If such was the case, however, a radical cure appears to have been attained, as the girl was free from recurrence five years later. The age of this girl is also exceptional for the development of a carotid tumor, as but few cases have been observed as young as sixteen years.

Case II appears to conform more closely to the usual type of cases that have been reported. The patient was a young man, aged twenty-four years, with a slow-growing lump that had been noticed eight years before it became sufficiently large to suggest to him the propriety of a surgical procedure for its removal.

A very interesting phenomenon in the first case was the sudden and prolonged tachycardia that followed the ligation of the carotid vessels. Apparently no injury was done to the pneumogastric nerve to cause a loss of its inhibitive action on the heart. In 1900 I operated on a man, aged seventy-three years, for a secondary growth of the cervical glands, which involved the vessels and nerves of the neck. I ligated and excised the three carotids for a space of several inches as well as the internal jugular and the pneumogastric nerve. At first the heart's action was rapid, but it soon subsided and was not more than 100 subsequently, and when he left the hospital ten days later it was about 85 beats per minute. There was no perceptible influence on the pulse of Case II when the carotid was ligated, and it never exceeded 80 per minute during the time he was in the hospital. In this case the

pneumogastric nerve was not seen, and I do not see how it could have been injured; but he had paralysis of the left vocal cord and post-operative contraction of the left pupil, so that damage must have been inflicted on the nerve itself or, more likely, on the left recurrent laryngeal branch.

Another point of considerable interest in Case II is the fact that while the common carotid artery tunneled the tumor the external carotid was not seen. In 1914 I operated on a woman for angiosarcoma of the skull, and ligated her right common carotid artery. The vessel was exposed for a long distance, and I made a careful search, but nowhere could I find a trace of the external carotid. It is possible that in each of these cases there was a high bifurcation of the common carotid artery.

The carotid body is a small structure situated at, or just posterior to, the bifurcation of the common carotid artery. It is not a gland in the usual acceptation of the term, but appears to belong to the sympathetic nervous system and to the chromaffin group. It is best developed in early fetal life and gradually disappears in later life. If it remains it is liable to develop into a tumor presenting evidences of malignancy. The function of this ganglionic mass is not known. That this structure is prone to evil is shown by the ever-increasing number of cases of "carotid tumor" that are being reported. These cases occur with practically equal frequency in males and females, and are found in almost the same ratio in the decades from 20 to 60. A few cases have been reported under twenty years of age and about an equal number above sixty. The youngest case reported was seven and the oldest seventy-four. The type of tumor is usually endothelioma or perithelioma, which is generally benign or but slightly malignant at first, but if not removed tends to become cancerous.

Able and elaborate papers have been written on this subject by Dr. W. W. Keen in 1906 (*Jour. Am. Med. Assn.*, 1906, xlvii, 469), and by Callison and MacKenty in 1913 (ANNALS OF SURGERY, December, 1913), in which all known cases have been collected and tabulated up to that time. Therefore, I have made free use of their statistics, but have collected, as far as possible, the cases that have been reported since their papers were published. Up to 1914, according to Callison and MacKenty, 60 cases of tumor of the carotid body had been observed; since that time 12 cases have been reported, including the 2 herewith presented.

Symptoms.—A tumor of the carotid body generally presents no symptoms of a subjective character, though sometimes there may be

either an alteration of the voice from pressure on the recurrent laryngeal nerve, cough, slight dysphagia, radiating pains, or a sense of discomfort or tenderness. Usually the patient seeks advice on account of a slow-growing lump in the upper part of the neck, which has either taken on a more rapid growth or has increased gradually to such an extent as to produce deformity and to cause embarrassment. Occasionally the growth is rapid from the start, but there is generally the history of a lump that has been in existence for several years. By the time the growth has attained a size sufficient to attract attention it is as large as a pigeon's egg or a hen's egg. The tumor is ovoidal or egg-shaped, and is single and usually occurs on one side only, though at least three cases of bilateral carotid tumor have been reported. The tumor is found opposite the thyroid cartilage and may extend upward toward the base of the skull or downward toward the clavicle. It is firm, smooth, movable laterally but not vertically, and sometimes has an upheaval pulsation and a bruit and thrill from its relation to the carotid vessels. Some observers have thought that there was an actual expansile pulsation, but this is not probable. The growth is encapsulated and does not infiltrate the surrounding tissues unless its malignancy is far advanced. At times there is an irregularity of the pupils from pressure on the cervical sympathetic ganglia.

Diagnosis.—This condition has been diagnosed before operation only a few times, but it is being recognized more frequently as its clinical features are becoming better known. In the case under my care I made a tentative diagnosis of carotid tumor, though I was by no means sure that such was the case until I saw its relation to the carotid artery. It has been mistaken most frequently for a tuberculous lymph-node, aberrant thyroid, carcinoma or sarcoma of the glands, as well as for various other conditions.

A single, slow-growing, firm, smooth, discrete, usually painless oval lump, more or less fixed, situated in the superior carotid triangle opposite the thyroid cartilage and anterior to or under the sternomastoid muscle, should always cause us to suspect a neoplasm of the carotid body.

Treatment.—Although Keen, in 1906, made the statement that unless the tumor is growing rapidly and presents evidences of malignancy it should not be removed, and Da Costa declared that he would not operate on another case, which resolution he promptly broke, I do not think there can be much diversity of opinion that these tumors should be treated, as are other actual or potential malignant neoplasms, by early and complete extirpation. The operation, however, should not

be approached lightly, as it may prove both difficult and dangerous. In most cases it will be necessary to ligate and excise one or more of the great vessels of the neck, and sometimes, either by accident or of necessity, some of the important nerve trunks, as the pneumogastric, hypoglossal, or sympathetic, may be cut or injured, thereby adding to the gravity of the procedure.

In some cases it is possible to dissect the tumor from the vessels without injuring them, which, while lessening the immediate mortality certainly adds to the probability of recurrence. In view of the fact that cases have been reported free from recurrence several years after the removal of the tumors by dissection, without ligation or excision of the arteries, I think we are justified in using this method in suitable cases.

The ligation of the common carotid artery is in itself a serious operation, and in many cases there is disturbance in the cerebral circulation that either terminates fatally or leaves the patient with paralytic symptoms. In a personal case, some years ago, I was obliged to ligate and excise the common and internal carotid arteries while removing a carcinomatous mass in the neck. The patient never regained consciousness, and died hemiplegic on the third day thereafter. Of the cases of carotid tumor operated on that have been reported, hemiplegia occurred seven times with two deaths and five recoveries. The cerebral complications, however, are not the only ones to add gravity to the operation. In several cases reported the tumor itself has been excessively vascular and the immediate hemorrhage has been severe, and in three cases death resulted from hemorrhage. Injury to the large nerves of the neck, either by accident or by design, occurs with considerable frequency, the most serious being the division of the pneumogastric. In four cases that terminated fatally from pneumonia the vagus was found to be cut in each. The hypoglossal nerve has also been divided in several cases, with subsequent partial paralysis and hemiatrophy of the tongue; but this is not a matter of great gravity. Division of the recurrent laryngeal nerve may occur and will leave the patient with a paralyzed vocal cord and huskiness of voice. In one case there was a constant cough after operation. Minor ill-effects, such as partial facial paresis from injury to twigs of the seventh nerve and inequality of the pupils from damage to the sympathetic, are sometimes noticed. In fact, of the total number of operations for removal of carotid tumors in only a few cases were no nerve injuries observed. Keen says that only 7 out of the 26 cases of removal of carotid tumors tabulated by himself were free from nerve symptoms subsequently.

Mortality.—I have knowledge of 64 cases operated on for tumor

of the carotid body, of which 5 were exploratory in character, leaving 59 in which the tumor was removed. Of 26 extirpations tabulated by Keen 7 were followed by death, or 27 per cent. mortality. Callison and MacKenty's statistics give 12 deaths in 50 removals, or 24 per cent., while there has been no immediate mortality in the cases reported during the past two years. Leaving out of consideration the uncompleted or exploratory operations there have been 59 cases in which the tumor has been extirpated, with 12 deaths, or a mortality of 20 per cent. As this is a material lessening of the mortality, it indicates either a better selection of cases for operation or an improvement in technic in dissecting the growth free instead of ligating and excising the great vessels. In 34 cases reported either all three carotids or the common and internal carotid arteries were ligated and excised, with 11 deaths, or nearly 33 per cent. fatality, but only two or three recurrences are noted. The ligation and excision of the external carotid artery alone does not seem to be attended with any special danger, and in a number of cases where the tumor has been removed by dissection the external carotid has been ligated also.

In 25 cases in which the common and internal carotids were not ligated, 24 recovered from the operation and only 1 died, but speedy recurrences occurred in 8 cases. It is probable, however, that several of these cases would have recurred after removal by any other method. It is an interesting fact that a case explored and considered inoperable by Holloway was living six or seven years subsequently; and several cases have been reported in which a tumor had been in existence from twenty to thirty-seven years previous to removal. In view of these facts we seem to be between Scylla and Charybdis. If we excise the carotid vessels with the tumor we have a large mortality from cerebral complications, but those patients who survive usually do not have recurrence of the growth; if we dissect the tumor free from the vessels the immediate mortality is small, but the tendency to recurrence is great. In such matters an operator decides upon the procedure to be employed according to his best judgment at the time of the operation. In my opinion the tumor should be removed by ligation and excision of the carotids, unless it is only very loosely attached to the vessels.

In 1906 Keen and Funke (*Jour. Am. Med. Assn.*, xlvii, 469) collected 29 cases of "carotid tumors," and in 1913 Callison and MacKenty (ANNALS OF SURGERY, lvi, 740) were able to find reports on 31 additional cases. In a by no means exhaustive search of the literature I have been able to find reports of the following cases not hitherto tabulated:

1. LEVINGS (*Wisconsin Medical Journal,* xii, 17): Man, aged sixty-eight years, growth only three weeks in duration following an injury; size of goose egg and growing rapidly.

Operation.—Internal jugular involved and excised, tumor dissected from carotids. Recovery from operation and death from recurrence in four and a half months. Diagnosis was not made previous to operation.

2. BALFOUR and WILDNER (*Surgery, Gynæcology and Obstetrics,* March, 1914, p. 203): Woman, aged thirty-four years, suffering with adenoma of thyroid, causing pressure symptoms and paralysis of right vocal cord.

April 5, 1913, under ether narcosis, the right lobe of the thyroid was excised, then a separate mass the size of a lemon was found in the right submaxillary region, at first thought to be an aberrant thyroid. Very adherent to surrounding tissues and intimately connected with the deep vessels. Internal jugular invaded and excised for four inches; vein filled with tumor mass. Carotid vessels not ligated. Convalescence rapid; left hospital on sixth day; subsequently developed hemiplegia, which persisted, and recurrence was thought to have occurred.

3. HOLLOWAY (*Southern Medical Journal,* vii, 557): Woman, aged thirty-five years; multipara; some dysphagia and choking; tumor size of walnut. Operation undertaken and discontinued on account of hemorrhage. Patient recovered from operation and was still living six or seven years subsequently.

4. SCHMIDT (*Beitrag zur klin. Chirurg,* lxxxviii, 301): Operator, Prof. Enderlen. Woman, aged fifty-two years, noticed lump on left side of neck for twenty years, growing rapidly for three months; now size of a hen's egg. Slight sticking pain and loss of weight. On right side of neck there is a much smaller lump in the upper carotid triangle.

Operation on left side under local anæsthesia. Large cavernous vessels overlying the tumor caused severe bleeding. External carotid ligated; common and internal carotid excised and the cut ends brought together with sutures. No disturbance of brain followed. Tongue on left side became atrophic and its protrusion lessened, indicating an injury of the hypoglossal nerve.

After seven weeks the right side was operated and the tumor dissected from vessels without injuring them. Patient well and free from recurrence a year later.

5. JOPSON and KOLMER (ANNALS OF SURGERY, lx, 789): Woman, aged twenty-seven years; March 19, 1913; growth the size of a pigeon's egg; two months in duration. No special symptoms; lump movable and painless. External carotid artery ligated but not the internal or common; no nerves injured. Discharged, cured, in eleven days. Pathological diagnosis: Perithelioma of carotid gland, chromaffin cells found. Diagnosis not made previous to operation.

6. COLLIER (*Surgery, Gynæcology and Obstetrics,* April, 1915, p. 484): Woman, aged fifty years; slowly growing tumor, the size and shape of a large walnut on the left side; five years in existence; of dark reddish brown color. No symptoms except a sense of fulness in the neck. Operation under ether. Three carotids ligated; nerves not injured. On second day œdema of larynx, hoarseness, paralysis of left vocal cord. Recovered and left hospital in sixteen days. Voice normal in six months.

7. OWEN (ANNALS OF SURGERY, lxi, 382): Colored soldier, U. S. Army; growth on left side, size of an egg; one year in duration; painless; slightly

movable; slight pulsatile upheaval; slight dysphagia. Tuberculosis and syphilis negative to tests.

Operation (March 19, 1914).—Ether anæsthesia. Tumor in the bifurcation of the carotid vessels; of bluish color and vascular. Dissected free from arteries; free bleeding controlled by clamps and packing. No complications ensued.

Man returned to duty in one month, well. Diagnosis: "Endothelioma from an intracarotid rest."

8. WILLIAM PERRIN NICOLSON, Atlanta, Ga. (personal communication): Mrs. C., white, aged forty-three years, housewife. Consulted Dr. Nicolson in May, 1914, for a large tumor of the neck. This began nine months before as a small movable tumor in the side of the neck, which was supposed to be an enlarged gland, and was so treated. The increase in growth had been gradual, and produced no special disturbance until recently, when the pressure symptoms began to give distress. Within the last month or two a small movable growth, much like the original, has appeared upon the other side of the neck.

Examinations showed the left side of the neck completely blocked by a very large tumor, which was practically immovable. It extended from just above the clavicle to the base of the skull, and the median side had pushed the trachea and larynx to the right of the middle line, while externally the edge of the growth was well overlapped by the trapezius muscle. The growth was clearly of a sarcomatous nature and a gloomy prognosis was given, and the operation distinctly discouraged. In spite of this the patient appeared the same afternoon at the hospital, and, in face of the discouraging outlook, asked for operation, which was performed May 16, 1914. The external border was first attacked, as being in less dangerous territory, and was finally with much difficulty lifted from under the border of the trapezius muscle, after the sternocleido muscle had been cut. At the inner side of the growth there was an intimate adherence to the thyroid gland, and above to the submaxillary, both of which were spread over the internal and upper edge of the tumor, so that a part of each gland was left attached to the growth. When the trachea was separated it was found to be deflected much to the right side of the median line. Finally the point was reached when by blunt dissection the fingers could meet under the growth and in front of the cervical spine.

In proceeding to release the lower pole of the tumor it was discovered that a rounded cord entering it contained the carotid vessels, and for the first time the character of the growth was discovered. This was clamped and cut through with scissors, the immediate effect of which was very alarming, and from this time on there was much disturbance of both respiration and circulation, and a number of times work had to be suspended. The upper pole of the tumor was so tightly jammed under the skull that it could only be removed by clamping the vessels behind, and cutting it away with curved scissors. The two carotids were quickly clamped and tied, as both were bleeding from the distal ends; but it was necessary to sew over the internal jugular vein at the jugular foramen, as there was not sufficient space to tie the vessel. A deep trough, extending from the base of the skull to the clavicle, bounded behind by the vertebral column, free from sympathetic and covered by the glistening tendon, of the rectus capitis anticus major. At times during the operation the pulse registered above 160,

but at the conclusion there was no serious shock. The time was one hour and forty-five minutes.

The physiological storm that followed for a week or ten days was very interesting. The typical laryngeal paralysis reduced the voice to a whisper, and there was practically complete paralysis of deglutition, fluids gushing back when attempts were made to swallow, accompanied by violent strangling and coughing. A severe bronchorrhœa developed in the left lung, and there was great difficulty in getting rid of the tenacious mucus. The pulse ranged as high as 150 at times, and the left side of the face and the left eye were intensely suffused with blood. Fortunately all of these symptoms gradually improved, and she became more comfortable, and three weeks after the first operation, attention was directed to the tumor upon the right side, which we had by this time become satisfied was also a carotid tumor. It was about the size of a large olive, movable from side to side, but could not be lifted up or moved upward or downward. The location corresponded with the bifurcation of the common carotid artery.

The patient, after discussing the dangers connected with its removal, consented to the operation, and, on June 5, the operation was undertaken. The tumor was easily reached on its anterior aspect, being covered only by the superficial structures, but on each side it was very intimately attached, requiring a careful and rather disturbing dissection. It was also very tightly attached at its lower pole, but when a line of cleavage was secured, instruments were abandoned, and the under surface was detached by peeling it away with the finger-nail. Finally it came away, leaving the vessels intact, and a sigh of relief came from all. Not a vessel had been ligated, and the small wound was closed with catgut and covered with a collodion dressing. In the meantime everything but the hoarse voice and the difficulty in swallowing had ceased, and the latter gradually improved. Even at this time a thickening began over the right side of the neck, and in five weeks after leaving the hospital the patient returned, with a distinct and rapid recurrence. She was put upon the Coley fluid, with a negative result.

Four months after the first operation the end came. At the site of the smaller tumor there was no recurrence, but it was evidently impossible to remove all the diseased structures.

9. Da Costa (*New York Medical Journal*, xcix, 253): Woman, aged forty-eight years; six children; has had trouble for eight months. Has bilateral tumors, each the size of a hen's egg. Some dysphagia and change of voice. Has lost 30 pounds in eight to ten months. No operation was done and the woman died a few months later.

Post-mortem examination revealed the tumors to be malignant growths of the carotid gland, of the type of perithelioma.

10. Sapegno (*Archiv. med. Turin*, xxxvii, 367) reports the findings at autopsy in the case of a woman, aged sixty-four years; apparently no operation was done.

TRANSVERSE INCISIONS IN THE UPPER ABDOMEN*

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Up to the year of 1910 it was my custom in operating upon the gall-bladder, or biliary passages, to make a vertical incision through the outer third of the right rectus abdominis, with separation of the muscle fibres. The average length of the incision was three or four inches. The incision was extended in one or both directions, when unexpected difficulties were encountered. If still more room was required in an upward direction, and none was obtainable on account of the encroachment upon the free border of the ribs, the incision was continued in an upward and inward direction, with transverse, or, better said, oblique division of the fibres of the rectus; so that in these cases the incision ultimately resembled that known in general as Körte's incision. These incisions as a rule gave ample exposure for all the required manipulations, notably simple cholecystectomies. I have always made an effort to close the incision by a layer suture; the first, a continuous suture line, included the peritoneum, transversalis fascia, and posterior sheath of the rectus; a few interrupted sutures then lightly approximated the separated fibres of the rectus; the third suture line of interrupted, rather heavy, chromicized catgut, included the anterior sheath of the rectus; and, finally, the skin was closed by either silk sutures or Michel clips.

The technic of suturing such a wound is self-evident, and to the uninitiated apparently very easy; very frequently, however, almost insurmountable difficulties arose, especially in the application of the first suture line. In most of our operations, particularly if the patient is very obese or very muscular (and in parenthesis, I may add, that fully 90 per cent. of the gall-bladder patients at my hospitals belong to the former group), the suture of the peritoneum was extremely difficult. The stitches tend to cut through; to overcome this tendency one is inclined to include more tissue in the bite of the needle; unfortunately this procedure not only does not mitigate the difficulty, but actually increases it.

After a great deal of trouble, and with considerable loss of temper, the surgeon finally succeeds in finishing the suture line; the result, how-

* Read before the American Surgical Association, May 11, 1916.

ever, is not satisfactory; the suture line is weak, and there are generally present also a number of smaller or larger holes, which permit the prolapse of small bits of omentum. In the greatest majority of the cases this suture line is so precarious that its protective value is *nil.* It is of course possible that it acts as a prophylactic to the formation of adhesions, by preventing contact between the intraperitoneal viscera and the extraperitoneal tissues. But even this is, I believe, illusory; as in the secondary operations that have fallen to my lot, I have found the adhesions to be so massive as to lead me to suspect that the suture line gave way upon the first strain, and not only permitted, but actually invited, the contact, which it was presumed to prevent. In this connection it is of great interest to know, that Sprengel found at autopsy, in a few cases which died shortly after a laparotomy through a vertical incision, that the peritoneal suture line had completely separated.

In a very large number of cases even this flimsy closure was impossible, and after vainly trying to fortify the first suture line, by including a part of the rectus, the attempt at a layer suture was very frequently given up in disgust, and the wound had to be closed practically *en masse,* the first suture line including the entire thickness of the abdominal walls, with the exception of the skin. I have often said on such occasions that by far the most difficult part of any operation upon the gall-bladder or biliary passages is the closure of the abdominal incision.

As this incision through the upper part of the rectus is, to my knowledge, the incision in greatest favor with most American surgeons, it is somewhat surprising that expression of similar dissatisfaction has not found its way into medical literature more frequently. Up to a few months ago I was even under the impression that my experience was unique, but in the September, 1915, number of *Surgery, Gynæcology and Obstetrics,* I read that Robins has experienced a similar difficulty, duplicated a few months later by Green, in the March, 1916, number of the ANNALS OF SURGERY, which has induced both authors to devise an improved method of suturing.

This condition of affairs rendered me, therefore, very receptive to suggested improvements, and in consequence I paid more than casual interest to the striking article of Sprengel, in the *Archiv f. klinische Chirurgie,* vol. xcii, p. 537. Sprengel realized the difficulties I have mentioned above, and set out to study the reasons for the difficulties, and was ultimately able to evolve a new, but nevertheless correct, principle in abdominal-incisions. It is necessary to state, however, that the rules that have been dictated by surgical principles in the past were also correct; but it is strange that surgeons have universally violated

these rules by the conventional abdominal incisions. It must be insisted that the credit which Sprengel deserves is not that he invented new principles but that his incisions were the first to correctly conform to those that have hitherto been recognized.

I essayed a transverse incision almost immediately after the appearance of Sprengel's article. My first operation is dated August 2, 1910, or almost six years ago. In the beginning I was somewhat diffident, and used the transverse incision only sporadically; my satisfaction, however, has been so great, that I am now using the incision with much greater frequency.

The correctness of the principles involved in transverse incisions will be discussed under the following two headings: I. The anatomy and physiology of the abdominal parietes. II. The surgery of the abdominal parietes.

I. THE ANATOMY AND PHYSIOLOGY OF THE ABDOMINAL PARIETES

The anatomy of the abdominal walls is simple; so simple, indeed, that it is easily forgotten. I trust, therefore, I will be pardoned, if I recall to your mind a few of these simple, but highly important, data.

The anterior abdominal wall is made up laterally of three flat muscles—the external and internal oblique, and transversalis muscles, and, centrally, the rectus abdominis. The three former, having various points of origin upon the sides and back of the trunk, finally terminate in the median line of the abdomen, by a broad aponeurotic expansion, which joins and interlaces with a similar aponeurotic expansion of the opposite side, and forms the linea alba. These aponeurotic expansions of the muscles are analogous to an ordinary tendinous termination of a muscle, and have an absolutely identical physiological function, namely, to become taut upon contraction of the muscle fibres. In other words, such an aponeurosis attached to a muscle acts really as if the muscle would terminate in a multitude of fine little tendons.

In previous articles, particularly when discussing the pathogenesis of hernia, I have frequently pleaded for the use of certain accepted anatomical names. I do so again, and this time my reasons are even more important than heretofore. Very frequently the word "fascia" is carelessly used, when in reality "aponeurosis" is meant. In the indiscriminate use of these words, one forgets that the physiological functions of fascia and aponeurosis differ widely. The function of fascia is to form a septum between two structures, while that of the aponeurosis is to follow the contraction of a muscle. If the latter function is borne in mind, we will, I believe, learn to regard the aponeurosis of the

anterior abdominal wall with greater respect than we are occasionally in the habit of doing.

While all these muscles have the same line of insertion, their points of origin are quite different; this would also render the direction of their force somewhat different; the difference, however, is so slight that, in view of the fact that the origin of all these muscles is upon the lateral and posterior aspects of the trunk, the general direction of the force must also be in a lateral direction.

The remaining integral components of the abdominal wall, namely, peritoneum and transversalis fascia, do not at the present moment call for extensive description. It is of some importance, however, to remember that the transversalis fascia is very delicate in the upper parts of the abdomen. It follows, therefore, that the peritoneum, transversalis fascia and posterior sheath of the rectus are inseparably welded together, and that consequently a separate suture of the peritoneum is a physical impossibility.

The peculiar arrangement just mentioned, and more particularly the resemblance of the several aponeuroses to a multitude of horizontally running little tendons, is of threefold importance in surgical technic. First, that an incision in a vertical direction will necessarily divide at right angles a large number of the small tendon-like terminations of all the three muscles; second, that after such division, the muscles when contracting will have a tendency to pull the wound more and more apart, and they will continue to do so, even after the incision has been carefully sutured; and third, that it increases very materially the difficulties in closing the wound, because the direction of the pull of the sutures is parallel with the tendon fibrillæ, and parallel also with the direction of the pull.

That this is not a fanciful theory, advanced merely as an argument to prove my contention, but an actual fact, will be verified by the experience of any surgeon of an inquisitive mind, and more particularly of those who frequently make use of the so-called Kammerer incision. In order to prove my statement it is necessary to first call attention to the difference in the arrangement of the aponeuroses of the abdominal muscles above and below the so-called semilunar fold of Douglas. As is well known, the aponeurosis of the transversalis muscle and the posterior leaf of the aponeurosis of the internal oblique pass behind the rectus muscle above the semilunar fold of Douglas (Fig. 1), while below the semilunar fold all the aponeuroses pass in front of the muscle (Fig. 2). Assuming now my previous contention to be true—namely, that the difficulty in suturing the peritoneum in a vertical incision is due,

first, to the peculiar aponeurotic termination of the flat abdominal muscles, and, second, to the intimate blending of the peritoneum with the posterior sheath of the rectus—it follows that the suturing ought to be easy wherever the peritoneum is not attached to these aponeuroses. Peculiarly both the positive and the negative sides of my contention are

FIG. 1.—Transverse section of the anterior abdominal wall above the semilunar fold of Douglas.

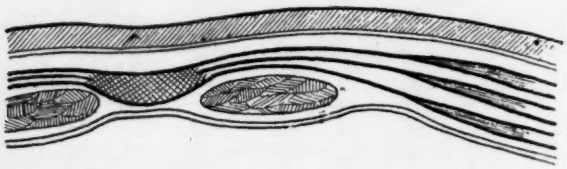

FIG. 2.—Transverse section of the anterior abdominal wall below the semilunar fold of Douglas.

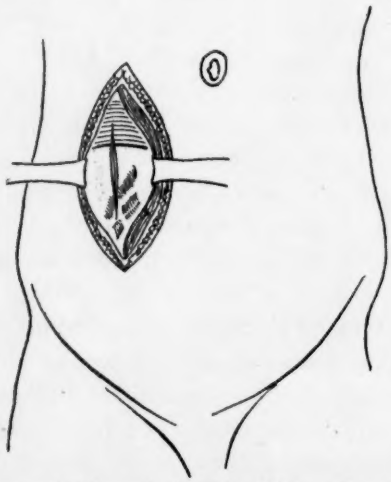

FIG. 3.—A Kammerer incision extending above the semilunar fold of Douglas.

proven perfectly by the Kammerer incision (Fig. 3). We find, in fact, that suturing below the semilunar fold of Douglas is perfectly easy, but, whenever the incision extends above the semilunar fold of Douglas, the suture will be as difficult as in an incision higher up; for instance, in the region of the gall-bladder.

Let us now assume for the sake of argument, that there is no such

muscle as the rectus abdominis, and that the space normally covered by the two recti is occupied only by the aponeurotic expansion of the three lateral flat muscles; and let me furthermore assume, that the space above alluded to would be much wider and much shorter than it really is; does it not also follow, that a correct surgical incision of the abdomen must be in a transverse, and not in a vertical, direction? And yet we find that, excepting Sprengel and his few followers, most surgeons make their incisions in a vertical direction. To my mind this can be due only to one of the following reasons: that a longitudinal incision parallel to the greater length of the trunk seems to be a more cosmetic one; or a fear

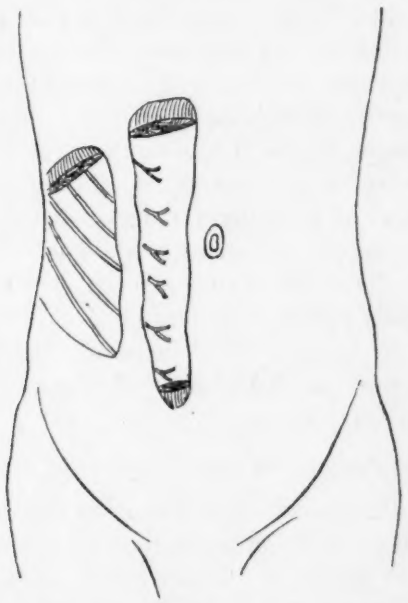

FIG. 4.—Diagram illustrating the nerve supply of the anterior abdominal wall.

of dividing transversely the presumably very important rectus abdominis; or the inviting ease with which the abdomen can be opened; or a simple passive acquiescence in conventional methods; or perhaps a combination of these reasons.

I also believe that much of the confusion is due to the name, "sheath of the rectus," which has been given by anatomists to this part of the aponeuroses of the three lateral flat muscles of the abdomen, because one is involuntarily inclined to look upon the "sheath of the rectus" as an integral part of the muscle, and that therefore its action and direction is dependent upon the muscle. As a matter of fact, the reverse is true; the

rectus muscle is attached only anteriorly to the sheath, and even here only at the three so-called lineæ transversæ; while its attachment to the posterior sheath is very loose, and readily broken up. The lineæ transversæ before mentioned do not penetrate the entire thickness of the muscle, but merely its anterior third or half. They, however, serve quite adequately to subdivide the rectus into comparatively short segments. As these segments have independent nerve supplies, it follows also that injuries to the muscle are confined at most to one particular segment, and do not influence the entire length of the muscle. This is of some importance to surgeons who practise transverse incisions, inasmuch as the gap caused by transverse division of the muscle in a particular segment is not near as large as it would be if it were pulled apart by the entire length of the muscle. Furthermore, it also follows that such a gap is very readily approximated, and, after healing has taken place, the final result represents merely an additional linea transversa.

All vertical incisions of the abdomen, except those made exactly in midline, violate another very important rule of surgical incisions, or at least run great danger of violating it, namely, that they come into conflict with the nerves supplying the rectus abdominis. These nerves, as is well known, enter the sheath of the rectus laterally and have in general a transverse or slightly oblique direction (Fig. 4). They are therefore exposed to injury by every vertical incision. On the other hand, a transverse incision runs parallel with the nerves, and consequently the risk of injury is only very remote.

II. THE SURGERY OF THE ABDOMINAL PARIETES

The requisites of a correct surgical incision may be discussed under the following headings, in the order of their occurrence. (1) Ease of execution, as far as "getting in" is concerned. (2) Amplitude of exposure. (3) Ease of execution, as far as "getting out" is concerned. (4) Post-operative comfort. (5) Cosmetic results. (6) Late results.

(1) *Ease of Execution, as Far as "Getting in" is Concerned.*— Although this paper is written to advocate transverse incisions, I can best discuss the above heading by exposing the relative advantages and disadvantages of the vertical and transverse incisions. In general it is agreed that the easiest, and at the same time also the quickest, way to enter the abdomen is by means of a longitudinal incision in the linea alba; no structures of great importance are encountered, and practically no vessels require ligation. Next in ease of execution are longitudinal incisions to the right or left of the median line, with blunt separation of the fibres of the rectus; in the lower half of the abdomen the deep

epigastric vessels, in the upper half the superior epigastric vessels may be injured, but can be readily controlled; if the incision crosses one of the tendinous inscriptions of the rectus, a few additional transversely running vessels may require ligation. Care must be exercised not to divide the nerves which enter laterally, but as a rule they can be retracted unless the incision is very long. Next in ease of execution are the incisions modelled after the Kammerer incision, with retraction of the rectus either toward or away from the median line; a slight delay may occur in liberating the anterior sheath of the rectus and its outer

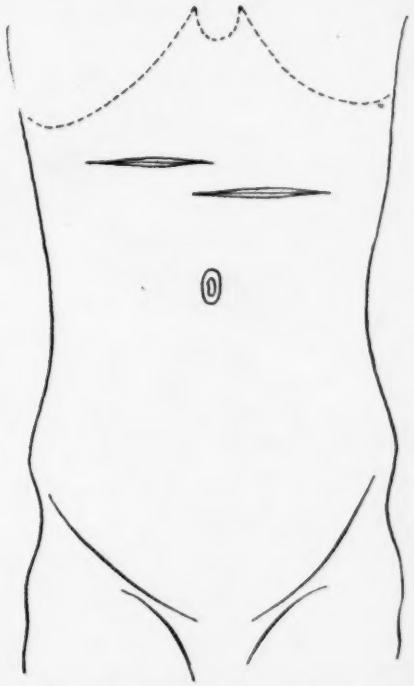

FIG. 5.—Two transverse incisions in the upper abdomen.

margin, at a tendinous inscription. All in all, these incisions are very simple, and can be rapidly carried out; candor compels me to add, that compared to these incisions, a transverse incision is quite a complicated surgical procedure.

Theoretically, the making of a transverse incision is very simple; everything is divided in a transverse direction;[1] in practice, however,

[1] It must not be forgotten, however, that the word "transverse" is used here to denote an incision at right angles to "vertical." In fact, only the rectus muscle is divided transversely, while all the other structures are in reality divided longitudinally.

the procedure is not quite so simple. Let us assume, for instance, that the incision is to be very short, say one for exploratory purposes, or through one rectus only (Fig. 5). Whereas vertical incisions do not bleed at all, or only slightly, the bleeding in transverse incisions may be annoying. The vessels run parallel with the muscle fibres, and within the substance of the rectus abdominis, so that if cut the vessels retract with the muscle fibres; they are caught only with difficulty, and, when caught, their ligation is not at all an easy matter.

If the incision is to be longer, and the median line has to be crossed,

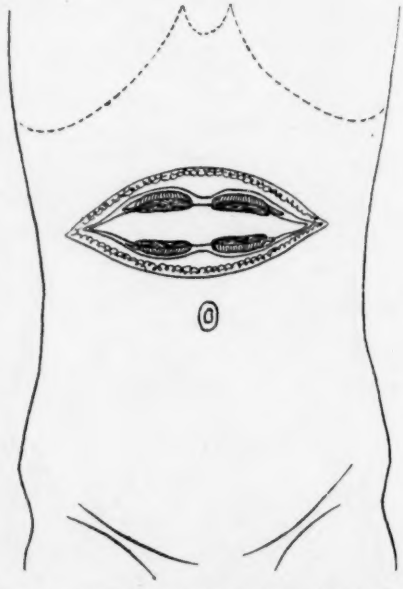

FIG. 6.—Transverse incision through both recti.

we are likely to come into conflict with the round and falciform ligaments of the liver. Occasionally the umbilical vein running within the round ligament is not completely obliterated, and if carelessly divided may be the source of annoying primary or secondary hemorrhage. It is therefore best to take care of it in every case, by preliminary transfixion and ligation. The rectus of the opposite side is now divided to the necessary extent, again encountering and dealing with branches of the superior epigastric vessels. A complete incision with division of both recti would therefore have the above appearance (Fig. 6).

Both Sprengel and Bakes advocate a method which differs somewhat from the preceding. They wish to avoid a division of the second rectus,

and attain this by a sharp division of both the anterior and posterior sheaths, while the muscle itself is merely retracted (Fig. 7). I have attempted to do so in a few cases, but found a very strong tendency on the part of the rectus to tear; on that account, and also because I do not fear any more a transverse division of the rectus, I have abandoned the method, and now boldly incise the second rectus for the requisite length.

Transverse incisions in the upper part of the abdomen are useful in all operations upon any organ in that location. They are particularly indicated in operations upon the stomach and gall-bladder. It is with some regret, therefore, that I see Sprengel describing an incision for

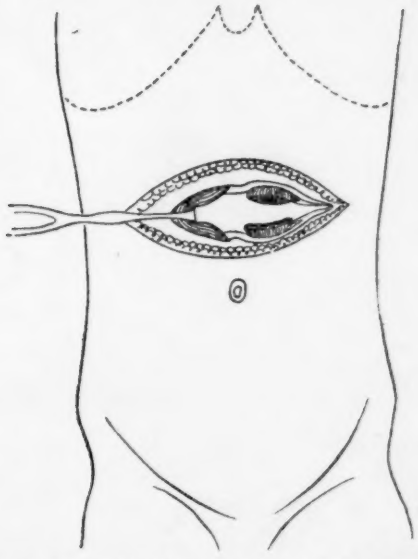

FIG. 7.—Sprengel incision with retraction of one rectus.

operations upon the gall-bladder, which is not *sensu strictu* transverse, because it runs parallel with the free border of the ribs, ends in a hook at its outer extremity, and then runs upward and outward parallel with the external oblique. The disadvantage of this incision is, that it is more liable to injure some of the nerves supplying the rectus. I have therefore never adopted this particular recommendation of Sprengel, but use with the greatest satisfaction for all gall-bladder operations a straight transverse incision. Incidentally, I may add that Bakes practises the same incision as I.

Surgeons, when first attempting a transverse incision, rather fear a complete transverse division of the recti, because they expect that an

unclosable gap will result thereby. Soon after Sprengel first described the method, modifications were proposed in order to prevent this contingency. I mention particularly Perthes (*Zentralblatt f. Chirurgie*, 1912, p. 1251), who advises a double transverse line of sutures (Fig. 8) to attach the rectus to its sheath. As Perthes feared that in applying these sutures the needle might penetrate the abdomen and injure an underlying viscus, he advised to first open the peritoneum at the linea alba, and then to use a finger introduced through this button-hole as a guard (Fig. 9). Long before I knew of this method I also made use of transverse sutures, but have never seen any injury, provided a little

FIG. 8.—Double transverse sutures to fasten the rectus to its anterior sheath.

care is used. I believe, however, that the great advantage of these sutures is not because they prevent retraction of the rectus, but because they act as a very efficient prophylactic hæmostat. I therefore continue to use some such suture line, and find that the time apparently lost in their introduction equalizes itself by the gain in time when the vessels do not have to be caught and ligated individually.

In conclusion I wish to assert most emphatically, that I have purposely gone into the minutest details in describing the technic of making a transverse incision, and have really exaggerated the disadvantages, because, barring those enumerated, everything else is absolutely in favor of the transverse incision.

(2) *Amplitude of Exposure.*—In the upper part of the abdomen I prefer an incision approximately two inches above the umbilicus; this may therefore be called my "normal" incision. The incision divides, first, either the right or the left rectus, depending upon the diagnosis of the case. As a general rule, the incision is made through the right rectus for all operations upon the gall-bladder and biliary passages, and through the left rectus for all gastric operations. I may also add, that by dividing the right rectus alone, ample exposure is obtained for a cholecystectomy, my operation of choice in cases of cholelithiasis; but in the complicated operations upon the hepatic or common ducts I do

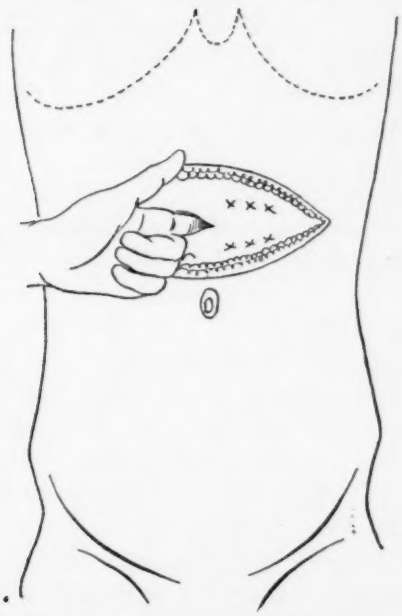

FIG. 9.—Method of Perthes of introducing the double transverse line of sutures.

not hesitate to also divide a part of the left rectus. Similarly, an ordinary gastro-enterostomy, with or without exclusion of the pylorus, can be done with ease by dividing only the left rectus; but in a pylorectomy for carcinoma with adhesions, or in excisions of ulcers upon the lesser curvature, perhaps high up near the cardia, I do not hesitate to extend the incision so as to also divide a part or whole of the right rectus. In no instance in my experience did I find any necessity to curve my incision upward or downward.

The exposure obtained from such an incision is beautiful; above all it should be noted, that even when the patient strains, the stomach and

intestines stay in the abdomen, and but very little packings are required to keep them so. I have frequently finished a gastro-enterostomy without having a single packing within the abdomen. The doing away with packings ought to be particularly welcome, because it doubtless aids in preventing many post-operative adhesions. I absolutely cannot agree with Kehr (*Archiv f. Klinische Chirurgie,* vol. xcvii, p. 74), who in condemning transverse incisions uses as one of his arguments the necessity of many packings. In view of my experience, this argument of Kehr is so surprising that I simply cannot account for it on any reasonable grounds. As it is, many of the arguments advanced by Kehr in favor of his "Wellenschnitt," and in opposition of all transverse incisions, such as ability to operate with only one assistant, the avoidance of instrumental retractors, the ability to use massive tamponade (it is well known that Kehr has very peculiar ideas regarding the after-treatment, which are not shared by many surgeons), are strange, to say the least.

In cases of obscure diagnosis, or when the incision is made for the purpose of exploration only, transverse incisions in the upper abdomen are particularly advantageous; by extending the incision in one or another direction, any operation on any viscus in the upper abdomen may be undertaken, obviating, as I have frequently seen, the necessity of two separate incisions in cases of mistaken diagnosis.

It is self-evident that transverse incisions in the upper part of the abdomen should be of additional advantage, because all of the organs in the upper abdomen—namely, the free edge of the liver with the gall-bladder, the stomach, the entire transverse colon, and the pancreas—run parallel with the greatest length of the incision, and greater areas of these organs can be more readily exposed through such an incision.

Should drainage be necessary, the drain is allowed to emerge at any convenient point, and does not interfere with the subsequent closure of the wound. I may also mention here, that the subsequent scar is not weakened by the drainage, and that I have never seen a hernia to result.

Objection might be raised to the transverse incision by the fact that it is difficult to expose, through such an incision in the upper part of the abdomen, the viscera situated in the lower part of the abdomen and pelvis. In reply I can only say, that upon a number of occasions I have removed the appendix through such an incision; and that if a major operation is to be done upon the pelvic organs, usually a separate incision must be made no matter whether the first incision is vertical or transverse.

(3) *Ease of Execution, as Far as "Getting Out" is Concerned.*—

I have conceded a slightly greater difficulty, and also a trifle longer time, in "getting into" the abdomen, in comparing the transverse with the vertical incision; the time so lost will, however, be made up during the operation *per se,* owing to the more perfect exposure; while during the closing of the wound there will actually be time gained. I make this statement with circumspection and yet definitely, because Sprengel, the originator of the method, contradicts himself somewhat regarding this point. On page 574 (*l. c.*) he makes the statement, that in difficult cases the suturing of a transverse incision takes twenty-five to thirty minutes; while on page 590 he states, that the much relaxed peritoneum, transversalis fascia, and posterior sheath of the rectus permit of an easy and rapid closure of the abdomen at the end of the operation. Even Kehr (*Archiv f. klinische Chirurgie,* vol. xcvii, p. 80), who, as is well known, is partial to his "Wellenschnitt" in all gall-bladder operations, and therefore condemns the transverse incision, praises the ease of closing the latter; he explicitly says that it was the only point about the incision which pleased him.

My method of closing the wound is the following:

Assuming that the incision does not extend beyond the limits of one rectus, a strong artery forceps first marks each angle of the incision. It has already been emphasized that the peritoneum is so intimately united with the overlying structures that no attempt is made to isolate it; the first suture line therefore includes not only the peritoneum, but also the transversalis fascia and the posterior sheath of the rectus, which, as is well known, is composed in this part of the abdomen of the blended aponeuroses of the transversalis muscle and posterior lamella of the aponeurosis of the internal oblique. As suture material I use either iodine catgut or, in very muscular individuals, chromicized catgut. The actual suturing proceeds easily and in a very leisurely manner up to the point at which the posterior sheath of the rectus joins the anterior; when this point of the suture line is reached the suture is tied (Fig. 10).

If the falciform or round ligament of the liver has been divided, it is now repaired by one or two sutures.

If more than one rectus has been divided, the remainder of the incision is now sutured in the manner outlined.

If drainage is used, the suture line is interrupted at the site of the drainage, and is finished on the other side of it in the usual manner.

The greatest saving of time is effected in this part of the operation. It actually must be seen, or better still, done, in order to be appreciated. I make this assertion not only on practical grounds, but also on theoreti-

cal grounds. In the previous pages I have already pointed out that a suture of a longitudinal incision is difficult on both anatomical and physiological grounds. If this statement is accepted to be true, and if the difficulty is really due only to certain definite anatomical reasons, then the converse must be also true, namely, that suturing of a transverse incision must be easy. This is really so for several reasons: First, because the suture line is not pulled asunder by the divided muscle, and, second, because the suture line approximates not a lot of little tendons, but acts as if it would tie together, as it were, a mass of little tendons.

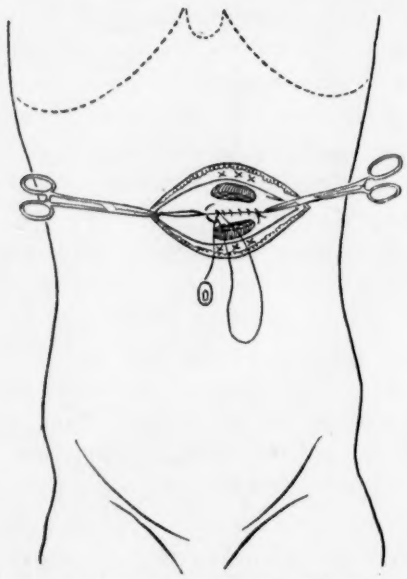

FIG. 10.—Suturing of the peritoneum and posterior sheath of the rectus.

All surgeons must be aware of the difficulties encountered in closing the peritoneum in a customary vertical incision; and after succeeding in finally closing it, how distressingly flimsy it is. Compare that with the playful ease with which the suturing of a transverse incision is done, and compare it with the evident firmness of this suture line, and I am confident even the most sceptical will be convinced. I am sure most surgeons must have experienced a dread of the entire suture line being torn open by the first straining efforts of the patient, but no such danger arises in a transverse wound, no matter how much the patient strains; on the contrary, the sutured edges only become tighter.

A couple of sutures are passed mattress fashion through each rectus and its anterior sheath (Fig. 11); these when tied approximate the cut

edges of the fibres of the rectus, and obliterate what otherwise might be a dead space. The incision in the anterior sheath of the rectus is then closed by interrupted chromicized catgut sutures (Fig. 12).

It being impossible to make a layer suture of the linea alba after a transverse division, this structure is repaired in every instance by as many interrupted through-and-through stitches as are indicated; usually two or three suffice. Finally the skin is closed in the ordinary manner.

(*4*) *Post-operative Comfort.*—My experience with transverse incisions leads me to unhesitatingly state that, soon after operation, patients with transverse incisions are in every respect much more comfortable

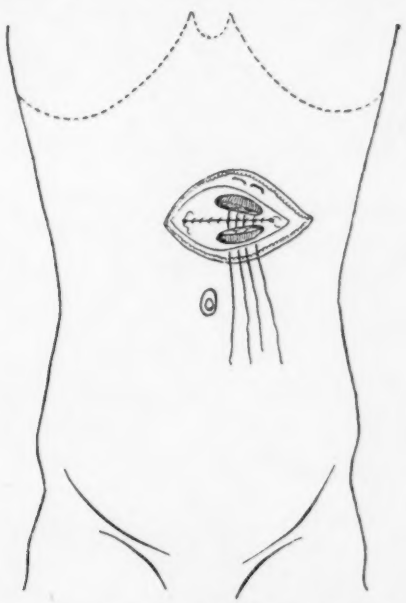

FIG. 11.—Mattress sutures to approximate the divided rectus.

than patients with vertical incisions. I have also noted that the vomiting is less in frequency and amount; but even if they vomit, it is associated with much less distress. There also appears to be much less pain in general, and particularly during all those functions which involve a strain upon the suture line, such as vomiting, sneezing, coughing, etc. It is self-evident why this must be so; in a vertical incision, during straining, the incision and suture line are pulled and torn apart, while in a transverse incision the opposite happens, namely, a relaxation of the parts.

I have also gained the impression that transverse incisions heal much more kindly than vertical incisions. I am at least certain, that a few

days after a major operation, such as pylorectomy, or excision of a gastric ulcer, or cholecystectomy, patients beg for food and for permission to leave the bed. I certainly have not seen such occurrences in a similar length of time in a vertical incision.

(5) *Cosmetic Results.*—The cicatrices resulting from a transverse incision remain as a fine line permanently, and show no tendency to broaden, like the best healed longitudinal cicatrices. This is not at all surprising, and is just what might be expected. A study of Langer's "split lines (*Spaltlinien*)," as illustrated in Kocher's *Operative Surgery,* not only invites a transverse incision in the upper part of the

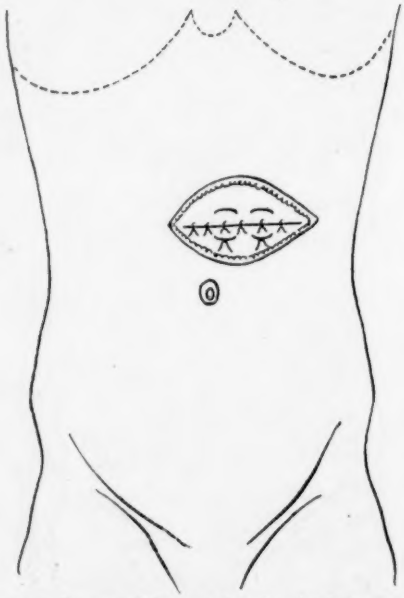

FIG. 12.—Suture of the anterior sheath of the rectus.

abdomen, but actually forbids a vertical one. I have watched these cicatrices very carefully, and I assure you I do not exaggerate when I state that most of them are hardly recognizable after a while, and must be searched for after the primary pinkness has faded away (Figs. 13, 14 and 15). This is practically analogous to the transverse incisions upon the neck, which, as is well known, give much finer and prettier scars than do longitudinal incisions. The site of drainage is drawn in slightly, but is not at all conspicuous or unsightly.

(6) *Late Results.*—The five requisites of a surgical incision of the abdomen which have been discussed thus far are all very important, they, however, play merely a secondary rôle, in comparison to the late

FIG. 13.—Cicatrix following transverse incision of the upper abdomen.

FIG. 14.—Cicatrix following transverse incision of the upper abdomen.

FIG. 15.—Cicatrix following transverse incision of the upper abdomen.

results; I refer particularly to the question of post-operative hernia. A perfect final result as far as post-operative hernia is concerned depends upon a number of factors. I do not intend to discuss these at length, but I may be permitted to refer briefly to some of them, as my experience has taught me that a number are influenced particularly advantageously by a transverse incision.

Surgical opinion is agreed that one of the most important factors in the prevention of post-operative hernia is a properly executed suture of the wound. I have already pointed out how difficult this part of the operation is in the customary vertical incision, and have also discussed the reasons for the difficulties. It is perfectly manifest, also, that such a poorly applied suture line is so flimsy at the termination of the operation, and so full of larger and smaller holes, as to permit of herniations or prolapses of the underlying omentum. If it does not do so immediately it does so very soon after the suture has been exposed to the first strain. If this manifestly inadequate suture line is compared with the very strong and firm suture line resulting from a sutured transverse incision, the superiority of the latter becomes absolutely evident.

It should furthermore be remembered that in the vertical incision the contractions of the lateral abdominal muscles have a strong tendency to pull the suture line further and further apart; while in the transverse incision the contractions of the lateral abdominal muscles not only have no such tendency, but, on the contrary, there is a strong tendency to approximate the edges. In other words, a particular advantage of this suture line lies in the fact that not only does it look beautiful at the moment of its application, but it, so to say, stays put subsequently also. It must be presumed, therefore, that such a perfect suture line must be an effective aid in the prevention of post-operative hernia.

Let us now examine a later stage of a transverse incision, which has healed by primary union, and has remained healed for some time. The peritoneal and aponeurotic incisions having been incised parallel with the course of the fibres, and having been sutured in the same direction, have doubtlessly united in an ideal manner. The only structure which was divided contrarily to correct surgical axioms is the rectus abdominis, and it is this part of the incision which requires careful scrutiny. I have frequently placed myself on record as denying the generally assumed important rôle of the muscles in the prevention of a hernia, and I ascribe this function only to the fascial and aponeurotic structures of the abdominal wall. Let us assume, however, for the sake of argument, that the rectus abdominis does share in this function; it is important, therefore, to inquire into the condition of the rectus

after its division and healing. I have had occasion to reoperate such patients only twice, and on both occasions I was surprised to find only a minimum amount of a very firm cicatrix in the substance of the rectus muscle; practically it was analogous only to an additional linea transversa. The nutrition of the muscle is apparently unimpaired, and, as its nerve supply has not been interfered with, its full function is also retained.

Bakes (*Archiv f. klinische Chirurgie,* vol. xcvi, p. 205), who was one of the first to put the Sprengel incision to a test, and who published his results in 275 cases, goes even so far as to say that in his experience it made no difference whether the rectus muscle was sutured or not; and even the cases in which no sutures were used to approximate the divided rectus healed ideally, and were not followed by a hernia.

It is conceded in general, that a most important factor in the production or prevention of a post-operative hernia is the amount and duration of drainage. In this connection I would therefore call attention to the fact that for a number of years it has been my custom to drain all cholecystectomies by a rather good-sized drainage tube, which is surrounded by strips of gauze, so that the final drain has a diameter of nearly one inch. It is also my custom to remove the gauze on the fourth or fifth day, while the tube drain is shortened gradually, and is not removed permanently until the tenth or twelfth day. In other words, my drainage is certainly bulky, and is certainly continued long enough. In spite of this fact, I have not seen a single case of post-operative hernia. The only difference to be seen between the drained and undrained cases is that there is a slight retraction, not a bulging, at the site of the drainage.

I know it is frequently stated that even a vertical incision is not followed by a hernia; but I also know that this statement is not warranted by experience. I have personally operated upon a number of herniæ following a gall-bladder and other operations through a vertical incision.

In this connection a short abstract of the history of the following case might be of some interest:

> Gussie S., twenty-six years of age, was admitted to Mt. Sinai Hospital, November 4, 1912, with the diagnosis of intestinal obstruction. A more definite diagnosis could not be made; but the few existing physical signs led me to the belief that the seat of the obstruction was located in the upper part of the abdomen. At that time (November, 1912) I was not as yet convinced of the far-reaching possibilities of the transverse incision. I therefore first made a vertical incision through the upper part of the left rectus,

very near the median line. I found a perfect example of that type of intestinal obstruction fully described by Payr, namely, dense adhesions between the left half of the transverse and upper half of the descending colon, with involvement of the splenic flexure; the descending colon was absolutely collapsed, while the proximal part of the transverse colon and the ascending colon were dilated. In order to obtain a better exposure, I added a transverse incision, so that the incision finally resembled an "L." The adhesions were separated, and when this was done the descending colon became distended with gas. Patient recovered. Primary union was obtained. I had an opportunity to examine this patient February 24, 1916, and found that the transverse cicatrix was solidly healed, but the vertical part of the incision had stretched, and was the seat of a ventral hernia.

After all, these arguments are only theoretical. The best, in fact I might say the only, way to judge of the late results of an abdominal incision is by examining patients after a considerable time. Fortunately, this has been possible in a fair percentage of my cases.

I find that I have operated 97 cases through a transverse incision, viz.: Cholecystitis (various forms), 36 cases; intrahepatic cholelithiasis with carcinoma, 1 case; abscess of the liver, 2 cases; gastric ulcer, 6 cases; perforated gastric ulcer, 2 cases; pyloric ulcer, 5 cases; duodenal ulcer, 13 cases; recurrent duodenal ulcer, 1 case; perforated duodenal ulcer, 1 case; carcinoma of the stomach, 11 cases; carcinoma of the stomach and pancreas, 2 cases; perigastric adhesions, 1 case; contraction of gastrojejunal stoma, 1 case; gastrocoloptosis, 2 cases; pyloric stenosis, 2 cases; intestinal obstruction, pericolic adhesions, 1 case; carcinoma of pancreas, 1 case; carcinoma of transverse colon, 1 case; torsion of omentum, 1 case; chronic pancreatitis, 3 cases; multiple cysts of kidney, 1 case; undefined abdominal pain, 3 cases.

The following operations were carried out on these patients: Cholecystectomy, 31 cases; cholecystectomy and choledochotomy, 6 cases; cholecystostomy, 2 cases; choledochoduodenostomy, 1 case; incision and drainage of abscess of liver, 2 cases; gastrojejunostomy (posterior retrocolic), 29 cases; closure of perforated gastric ulcer and gastrojejunostomy, 2 cases; closure of perforated duodenal ulcer and gastrojejunostomy, 1 case; excision of gastric ulcer, 1 case; partial resection of stomach, 3 cases; pylorectomy, 1 case; Coffey-Beya operation, 2 cases; liberation of perigastric adhesions, 2 cases; liberation of pericolic adhesions, 1 case; extirpation of omentum, 1 case; colosigmoidostomy, 1 case; appendicectomy, 3 cases; transperitoneal nephrectomy, 1 case; exploratory laparotomy, 7 cases.

Nine of these patients died during their stay in the hospital. Six patients died after their discharge from the hospital, at intervals varying from a few months to over a year. Three patients probably died, as they were afflicted with a fatal malady. Twelve patients could not be traced. Deducting all these there are available for examination 67 cases. I have personally examined every one of these cases at the time of writing this paper, and *did not find a single hernia.* The period of observation is from a few months to almost six years.

In discussing the question of post-operative hernia after transverse incisions, two of my cases are of special interest, because they prove two very important points: first, that a perfect result can be obtained even after relaparotomies, and, second, that an excellent result can be obtained even after very imperfect suturing, and in the presence of infection.

CASE I.—Rose B., forty-six years of age, was admitted to Mt. Sinai Hospital, December 23, 1912, with a history of repeated attacks of cholecystitis extending over a number of years. She was operated upon by me December 26, 1912; the operation was a cholecystectomy, and was done through a transverse incision through the right rectus. Patient was discharged with a well-healed cicatrix January 9, 1913.

Patient was readmitted January 27, 1913, and stated that for the past five days she had been again suffering from attacks of pain in the epigastrium, which were severe enough to require the administration of morphine.

The presence of a slight, but undoubted, subicteric tinge of the sclera complicated the clinical picture.

Patient was kept under observation for a few days, but finally the general condition deteriorated to such an extent that exploration was decided upon. February 6: Incision through the old scar. A constricted loop of small intestine was encountered adherent at the site of the previous operation; in liberating this loop it was damaged to such an extent that I found myself compelled to resect four inches, after which I made a side-to-side anastomosis. After considerable difficulty the common duct was isolated, incised and probed in both directions. No obstruction was found, but it was drained, nevertheless, by a T-tube. The wound was closed in layers.

The post-operative course was marred by a pneumonia and pleurisy. The biliary discharge continued for a very long time, and the fistula did not close finally until March 17. Even then the convalescence was very slow, and the patient was not discharged until April 12.

I saw the patient January 15, 1916, or just three years after operation, and the result was ideal in every respect; scar was absolutely firm.

CASE II.—Morris T., forty-one years old, was admitted to my service at Mt. Sinai Hospital, November 19, 1914, with a history of an ulcer of the stomach of fourteen years' duration. Patient was operated upon through a transverse incision through both recti, on November 25. The operation consisted of an excision of an ulcer of the stomach situated upon the posterior wall near the cardia. The subsequent closure of the defect of the stomach was exceedingly difficult. The post-operative course was very stormy, as the patient vomited continuously and required very frequently repeated lavage. This put such a strain on the sutured abdominal incision that I was not at all surprised to find, on December 3, that about four inches of it had separated; I therefore resutured it, without any anæsthetic.

On December 5 the persistent vomiting and inability to retain any nourishment compelled me to reopen the abdomen through the original incision for the third time, for an intestinal obstruction, due to a band. The operation lasted but a very short time, as all that was necessary was to divide a band; patient, however, went into a deep collapse. In order to obviate a death upon the operating table, I hurriedly closed the wound with five through-and-through silk sutures.

To my surprise and gratification this patient also recovered, and was finally discharged January 9, 1915. The wound, although infected and only very inadequately sutured, healed with a perfect scar; and in spite of these disadvantages no trace of a hernia was to be seen at my last examination, March 26, 1916.

Bakes (*l. c.*) re-examined 67 of his cases operated through a transverse incision and has not found a single hernia. Bakes's period of observation is much too short for a final judgment, and I hope that perhaps my small statistics will aid in elucidating this point.

THE TECHNIC AND THE MANAGEMENT OF OPERATIONS ON THE STOMACH *

By George W. Crile, M.D.
of Cleveland, Ohio

Although surgery of the stomach has attracted to its problems the most gifted men of their day—from Billroth to Mayo; although every trick of technic, every plan of management suggested by intense study and large opportunity has been employed, yet the mortality rate in major cases remains high.

If there is to be improvement over the results already secured, it is obvious that it will not be from improved judgment, nor from greater experience or more skilled technic, but that improvement will come through the application of some other factor. It is only by extending our vision so as to comprehend more completely the patient *as a whole,* as well as the local lesion, that progress will be made.

If we bear in mind that life is possible only in an alkaline medium; that the sources of the alkalinity of the body are food and water, and that the mere expression of life—the maintenance of body heat, the production of muscular action and emotion, and the injury of body tissues—produces acid by-products, then it is readily seen that in a patient whose food intake has been reduced to a minimum by pyloric obstruction, the ability of the body to maintain its alkalinity will be correspondingly diminished and the patient will easily be pushed beyond this low margin of safety by the acid-producing factors of the operation.

It becomes obvious, therefore, that in these cases we must aim to increase the reserve alkalinity, and to diminish or control the production of acids in the operation itself.

First, the reserve alkalinity may be increased by administering approximately 2000 c.c. of normal saline solution subcutaneously the afternoon and evening before and on the morning of the operation; and giving approximately 100 grains of sodium bicarbonate by mouth or by rectum. Perhaps the most important pre-operative procedure is a night of natural or artificial sleep, since the real lesions produced by acidity are repaired only during sleep.

Second, the acid-producing factors connected with the operation are worry, exertion, inhalation anæsthesia, the cutting and handling of

* Read before the American Surgical Association, May 11, 1916.

unanæsthetized tissue, and post-operative pain. Fear and worry are largely in the control of the surgeon and nurses. In bad risks the indications are for nitrous oxide analgesia; anæsthesia only during the period of manipulation; local anæsthesia throughout; feather-edge dissection; minimum handling; quinine and urea infiltration of the abdominal wall; opium to control post-operative pain; normal saline solution subcutaneously until food is taken; and a five per cent. solution each of sodium bicarbonate and glucose by the Murphy drip. The patient should be propped up in bed early; put on his feet early; and should be in condition to go home early.

In doubtful cases, if resection is to be done, the operation, as Lilienthal has suggested, should be performed in two stages; the first a gastrojejunostomy; followed by the resection in about a week or ten days. At the end of this interval the nutritional balance will have been immensely improved, the reserve alkalinity will have increased, and the morale of the patient will be improved.

As Mayo has indicated, an ample incision is made and, as in all anociated operations, the skin incision and every division of nerve-bearing tissue is preceded by the injection of novocaine; and immediately after opening the abdomen a massive infiltration with quinine and urea hydrochloride is made at a distance from the line of incision. As to the length of the loop of jejunum, we are satisfied that no absolute rule should prevail except that it should be long enough to lie comfortably and easily. This is as much a matter of mechanical adjustment as is the work of an engineer or a joiner. So, likewise, the direction in which the jejunum shall be turned depends upon the position of the gastrojejunostomy opening in the stomach. If the opening in the stomach is far to the left of Treitz's ligament, so that the pull will be toward the left, then the jejunum should take its course to the left. It is better to make the stoma in the stomach as near the pylorus as is mechanically feasible. In the large majority of cases, therefore, the anastomosis falls to the right of Treitz's ligament, in which case the jejunum is carried from the left to the right.

As to the position and direction of the opening in the stomach, obviously, as has been well brought out by Hartman, it should be near the pylorus, and we are satisfied that it is best to make the incision in the stomach along the middle zone, where there are fewer blood-vessels, and parallel to the long axis, as thus the stomach will lie comfortably along the long axis of the jejunum. I cannot conceive that the traction of the jejunum to the left or right, or the position of the stoma in the stomach, whether vertical, transverse or longitudinal, can have any

influence whatsoever upon the passage of the food out of the stomach or on the propulsion of the food after it has reached the intestine. The *opening* has no propelling power, that power lies in the mechanism of the stomach and the jejunum respectively. The opening in the mesocolon is best made by sharp knife dissection rather than by a blunt perforation or by a tear made by traction, as thus more definitive and purposeful control of the opening is possible. We suture the mesocolon opening an inch up on the stomach wall so that this portion of the stomach goes down through the mesocolon like a hopper and the freedom of the ends of the jejunum is unhampered. We believe that this is preferable to suturing the mesocolon opening upon the line of suture at the stoma between the stomach and the intestines, as in this position it may produce kinking at the point of junction between the ileum and the stomach.

As to the first line suturing, we agree with Mayo, that silk and linen should be avoided. We use chromic gut for the sutures that come in contact with the mucosa. For the peritoneal layer we use interrupted silk sutures made as Cushing right-angled stitches. These stitches include the muscular coat and are so placed as to be equivalent to a continuous suture. At the point where the stomach and jejunum are approximated we put in two or three carefully placed interrupted sutures, so that the duodenum is brought in contact with the stomach wall on each side of the incision for a distance of from a half to one inch.

The main suture which controls absolutely both hemorrhage and leakage is made with the shoemaker stitch, the introduction of which is facilitated greatly by the Bartlett needle and suture. The shoemaker stitch includes the entire structure and strength of the wall of the stomach and intestine.

The Resection.—In most cases it will be found that the gastrojejunostomy and the interval of adjustment have accomplished for these patients what the delay of a week accomplishes for fractures of the patella; what iodoform gauze packing accomplishes in the first stage of a laryngectomy; what acute salpingitis does for later salpingectomy. In each instance the protective reserves against infection are called out into the local field and adequate local defense against infection in the later operation is thus guaranteed. Usually very few fragile adhesions will be found and the entire operative field will be easily mobilized. The gastrojejunostomy will appear as if it were a natural opening. In most instances no pull or strain will be necessary to develop the field, and the gastrojejunostomy will not interfere with the elevation of the stomach for the resection. The stomach is carefully divided with a cautery between Payr's clamps, and the margins of the division are sterilized

with the cautery. The searing should be done so slowly that not a drop of blood will appear on the surface. But another and most vital purpose is achieved by this cauterization. One of the commonest dangers in operations for cancer anywhere is that of cancer implantation on the fresh tissues. The searing makes a dry charred surface which cannot sustain cancer growth. Therefore the cautery sterilizes against pyogenic infections and against cancer growth and prevents bleeding—three of the most important considerations in gastric resection. As in the gastro-enterostomy, protection against leakage or hemorrhage is secured by the shoemaker stitch, and to make assurance doubly sure a special invaginating silk stitch is put around each angle with a final separate layer of right-angle silk stitches. The duodenal end is inverted by a purse-string suture.

Clinical Results.—The total number of operations on the stomach by my associates, Drs. Bunts and Lower, and myself and in the Lakeside surgical records are 468. Comparing our previous results with those since the foregoing principles have governed us, Dr. Lower and I have performed, up to May 1, 127 operations. In this series there have been two deaths.

MORE RADICAL TREATMENT OF DUODENAL AND GASTRIC ULCER *

By John B. Deaver, M.D.
of Philadelphia, Pa.

It is now known that duodenal ulcer is more frequent than gastric ulcer. Duodenal ulcer is most often located upon the anterior and lateral wall of the first portion of the duodenum. The next most common site is the posterior wall of this portion of the intestine, and the least common site the inner pancreatic wall of the second portion of the duodenum.

Where the ulcer is small and is located upon the anterior wall of the first portion of the duodenum it is my practice to excise it, close the opening in the intestine, plicate the duodenum and make a posterior gastro-enterostomy. When an ulcer in this portion of the intestine is large, but extending short of the head of the pancreas, I amputate the duodenum below the lesion, purse-string it, invert, excise the pylorus, and make a posterior gastro-enterostomy. When the ulcer is on the posterior wall of the first portion of the duodenum and not too adherent to the posterior abdominal wall to permit of freeing the duodenum, I practise the same technic as in large ulcers upon the anterior wall.

When the amputation of the duodenum is made so close to the head of the pancreas as to preclude the use of the purse-string suture and inversion, I adopt one of two procedures; namely: (1) dissect the inner wall of the duodenum free from the pancreas (taking care not to injure the common bile-duct), purse-string it, invert and reinforce line of duodenal stump with great omentum, or (2), if this cannot be safely done, close the end of the duodenum with a continuous chromic catgut stitch and sew the head of the pancreas over the duodenal stump. This I have done in many cases with good results up to the present, except in one instance. The chief point for discussion in the latter technic is the effect that the pancreatic ferments may have upon the transplanted duodenal stump, or, *per contra,* the possibility that the infection from the duodenal stump may be communicated to the pancreas.

In acute perforation of a duodenal ulcer it is my practice to make a posterior gastro-enterostomy at the primary operation. I have now

* Read before the American Surgical Association, May 10, 1916.

operated upon 44 patients in this manner with but one death. My reasons for advocating this procedure are, first, in order to place the ulcerated area immediately at rest; second, to secure the ultimate advantage of the operation, which is curative in many cases, and, third, because my experience with it has been so satisfactory as to entirely outweigh any theoretical objections that may be made against it.

The most common site of ulcer of the stomach is at the pylorus and the most common form of ulcer the chronic indurated. Next in frequency of location is the lesser curvature, the posterior wall, the anterior wall, the margin of the œsophageal opening and the fundus.

The chronic indurated ulcer of the pylorus I always treat by making a pylorectomy. When the induration of such ulcer involves the lesser curvature in proximity to the pylorus, I make a subtotal gastrectomy.

Small ulcers of the lesser curvature, with but little induration, are better dealt with by excision—first open the lesser peritoneal cavity by breaking through the superior layer of the gastrohepatic omentum and ligate the arteries to either side of the ulcer, then excise the ulcer, close the opening in the stomach by oversewing the mucous membrane with a continuous chromic catgut suture and with the same suture oversewing the remaining coats, completing the closure with a continuous Lembert (Dupuytren) catgut or linen suture.

When the ulcer is on the lesser curvature and the induration involves to a considerable extent the anterior and posterior walls of the stomach, it is my practice usually to make a circular resection with end-to-end union. In the latter type of ulcer if the condition has involved so much of the anterior and posterior walls of the stomach as to cause the hour-glass stomach, I make a circular resection in some cases, while in others I make a gastrogastrostomy between the pouches and a posterior gastro-enterostomy with the lower pouch. When the ulcer is located on the posterior wall, excision through the interior of the stomach is the operation of choice. In the latter operation, having excised the ulcer and closed the stomach, in order to insure against any possible chance of leakage, I open the lesser peritoneal cavity by going through the anterior layer of the gastrocolic omentum, expose the posterior wall of the stomach at the site of the sutured ulcer and reinforce the line of suture with a continuous Lembert (Dupuytren) suture, afterwards closing the opening in the gastrocolic omentum.

Any ulcer that has not gone deep enough into the mucosa to cause hemorrhage, that has not obstructed the pylorus, or remained chronic long enough to be indurated, can only be demonstrated with certainty by opening the viscus to inspection; this I have done a number of times.

This type of ulcer should be treated by operation. Gentle palpation of the stomach may detect such an ulcer, yet as a rule an ulcer in this stage can only be located by incision and inspection.

CASE I.—Female, aged fifty years, married. Chief complaint, feeling of pressure in epigastrium. Two years ago began with a feeling of pressure and fulness in the epigastrium, at which time her feet commenced to swell and remained swollen for a week. Always has considerable gas; eructates freely; frequent vomiting; vomiting not preceded by nausea and occurs independent of taking of food. Never jaundiced, never any very severe pain. Bowels constipated. Has lost 17 pounds in the last year. During this time has been under medical treatment without any result.

Previous Medical History.—Ordinary diseases of childhood. Nervous breakdown two years ago, when was operated for laceration of cervix; peritonitis following operation.

Urine: Specific gravity, 1080, faint trace of albumin, otherwise normal.

Test-meal: Free hydrochloric acid 50; total acidity 70; occult blood faintly positive to benzidine; negative to guaiac.

Full meal: Removed in eight hours; 60 c.c. recovered; free hydrochloric acid 18; total acid 38; occult blood positive to benzidine; negative to guaiac.

Operation.—Abdomen opened; small hardened area, size No. 6 shot, felt in the lesser curvature of the stomach. This had been demonstrated by X-ray examination as an ulcer by Dr. Cole of New York City. Gastrotomy—when the hardened area was found to be due to a small ulcer which had involved the mucous and muscular coats. Ulcer excised.

Culture of interior of stomach taken at time of operation, sterile.

In my opinion, as well as in the opinion of others, posterior gastro-enterostomy does the greatest good when the pylorus is obstructed. In ulcers located other than at the pylorus, this operation does but little if any good; and, if any, only by allowing enough bile and pancreatic juice to enter the stomach, thus producing a neutralizing effect upon the hydrochloric acid. That this operation accomplishes any good by drainage alone, I think is doubtful. To repeat, where this operation accomplishes most good is when there is pyloric obstruction and when the ulcer has been excised.

I have, however, seen good results from a posterior gastro-enterostomy with occlusion of the pylorus in multiple erosions (Dieulafoy ulcer) of the stomach causing repeated bleedings. It is not my practice

to advise operation in these cases until medical treatment has been tried or a focus of infection, such as a diseased appendix or gall-bladder for example, has been removed.

When excision of the ulcer has not materially interfered with the mechanics of the stomach, with the exception of the pyloric ulcer, posterior gastro-enterostomy should not be done. I never make a posterior gastro-enterostomy in central resection of the stomach, for example.

Ulcers of the margin of the œsophageal opening and of the fundus of the stomach, if we are fortunate enough to see them very early, before there is much induration, could be excised. Ulcers in these locations I admit are rare, but that we occasionally meet with them in an advanced stage we must concede. I have seen a few cases of carcinoma in these locations which I believe were implanted on ulcer.

To summarize, I have come to the conclusion that all ulcers of the duodenum or stomach are best treated by excision.

In the presence of a strong clinical probability of gastric ulcer supported by positive X-ray evidence or doubtful findings to palpation and inspection I do not hesitate to perform gastrotomy in order to settle the matter by inspection of the mucosa.

In the individual case the advisability of excision depends upon the local condition. No ulcer should be excised when subsequent closure and anastomosis present too great operative hazards. It is in such cases that operations which depend upon drainage and alteration of gastric chemistry have their field.

RADIUM TREATMENT OF UTERINE CANCERS*

By Joseph Ransohoff, M.D., F.R.C.S. (Eng.)
and
J. Louis Ransohoff, M.D.,
of Cincinnati, Ohio

The mortality of radical removal of the uterus for cancer, that of the body excepted, is so high and the end result so gloomy that we would all welcome a method of overcoming the disease, if without instituting a hazardous operation it would offer at least an equally good end-result. Whether radium treatment can do this, the next few years must determine.

Whatever else may be said of it, it does not immediately jeopardize life; it at least is safe. The discovery of the unique qualities of the ultra-penetrating gamma rays by Dominici marked an epoch in radium therapy. His principle of filtration permits the use of large quantities of radium without destructive effects on healthy tissues. It also permits the deep action of the rays without interfering with the viability of superficial tissues covering deep-seated lesions.

While it is not within the scope of this paper to discuss the scientific principles of radium therapy, a few words may not be out of place.

Numerous microscopic observations have shown that radium has a definite selective action on neoplastic tissue. For instance, a cancer of the uterus treated by radium shows definite histologic changes. During the first two weeks there is increase in size and vacuolization of the nuclei and numerous atypical mitoses are found. This is followed by change in form, enlargement, and vacuolization of the cancer cells; retardation and finally cessation of nuclear division. The last stage is the destruction of the cell. This is accompanied by infiltration of leucocytes, the formation of new connective-tissue cells, and gradual replacement of neoplasm by fibrous tissue. There is always an obliteration of the blood-vessels, probably due to a proliferation of the intima. This in itself tends to the destruction of the highly organized neoplastic cells by interference with nutrition. It is one of the most potent factors in the radium cure of uterine fibroids. The metamorphosis of the cancer cells is always interesting, and at times unusual. Occasionally one may see in typical cancers of the cervix a tendency to cornification. In clinically cured cases of uterine cancer there are at times seen nests of

* Read before the American Surgical Association, May 10, 1916.

changed, but undestroyed, cancer cells, imbedded in dense fibrous tissue. Whether or not these cells are capable of further growth and dissemination has not as yet been determined.

Whether the action of radium on neoplastic tissue is specific, or whether it is due to the great cell richness of the latter is merely an academic question. All things being equal, the action of radium on any tissue is in proportion to the abundance of nuclei. This has been well shown by Keetman and Harting,[1] who have shown that radium depends for its action on the denser substances in the nuclei of the cells. For this reason, the more closely the tissue approaches the embryonal type, the more amenable it will be to the radium treatment. This accounts for the remarkable results achieved in the treatment of lymphosarcoma. Also, the comparative obstinacy of periosteal and chondrosarcoma to radium action.

The uterus presents an unusually fertile field for radium therapy, partly from the histologic structure of uterine cancer, but particularly because of its unusual accessibility. The radium can be brought into immediate contact with the neoplastic tissue where it can exert its direct influence. The primary results of radium therapy in this field have even exceeded the hopes of a few years ago. The reports grow more and more encouraging.

According to the report of the London Radium Institute, of 1914, uterine cancers yield most gratifying results, and the effect of radium in operable cancers is far in advance of those obtained by any known surgical or medical treatment.

Degrais [2] has a number of cases apparently well after four and five years, Rubens Duval,[3] in a report of five years' experience, recounts a most interesting case of inoperable cancer of the uterus, which died of some intercurrent affection several years after radium therapy. Autopsy showed a complete anatomical cure. Of 158 cases reported, radium had a beneficial action in 155. In 93 the improvement was classed as phenomenal, while in 46 there was a probable cure.

Degrais and Belot have seen no case of cancer of the uterus in which some benefit has not been given by radium therapy. The question of the entire replacement of radical operation by radium therapy may soon come up for final solution.

The mortality of the Wertheim operation is from 15 to 25 per cent. in the hands of the best operators, and far greater in those of the average surgeon, and the percentage of cases which are in condition to undergo this operation is not very large. Probably the greater number of those who undergo the Wertheim operation suffer from recurrence

within the first year after operation. Many operators have taken the mid-ground in the treatment of operable cancers of the uterus. For instance, Pozzi [5] has given up the extensive Wertheim operation even in border-line cases, and treats them with radium alone. In operable cases, a simple vaginal hysterectomy is done, followed by prophylactic radium application.

The consensus of opinion of all operators is that operation after radium therapy is exceedingly difficult. For instance, Kelly [4] says in the conclusion of his article, " in border-line and inoperable cases we advise the use of radium, as operative measures are impossible in this group. If the growth disappears, it can only be determined whether or not hysterectomy is advisable by trying out both methods. This as yet has not been done in a sufficient number of cases to arrive at any definite conclusion. We do feel, however, that when clinical cures have occurred in operable cases, operations are probably best not carried out."

In a personal communication Kelly stated that inoperable and border-line cases clinically cured by radium should *not* be subjected to operation.

The reason for the difficulty of operation in cases after radiation is easily understood from the fact that there is a great deal of fibrous tissue deposited which makes clean dissection extremely difficult and dangerous.

> We have recently seen a striking example of this diction. In September, 1915, we saw a woman, aged forty-three. Five years before, a supravaginal hysterectomy had been done for fibroid. In June, 1915, she began to pass clots of blood. There was a great deal of backache. Examination shows cervix fixed and occupied by hard cancerous nodules. There was a marked infiltration of the left broad ligament. Under radium treatment the mass melted away, the bleeding stopped, and the pains disappeared. In March, 1916, against our advice, a vaginal removal of the cervical stump was attempted. The operation was exceedingly difficult and incomplete. The specimen removed showed a great deal of fibrous tissue and some few nests of embedded cancer cells. From the time of the operation the pains recurred and the wound did not heal. Manifestly, as we have stated before, anything like a complete operation is impossible after extensive radium treatment. Whether this case would have remained permanently well is doubtful. Her condition, however, was certainly only made worse by operation.

The results of Kroenig and Doederlein [5] are only too well known to require more than mention.

The immediate local results of radium are phenomenal. Within a

week of the first application the hemorrhage is, as a rule, arrested and the foul discharge stopped. We have not had a case in which we were not enabled to arrest both the offensive discharge and the hemorrhage within from one to three weeks. The cauliflower vegetations which frequently fill the vagina seem to melt away. The improvement of the general condition of the patient is astounding. Pain is sometimes relieved within a few days of the first application. The most difficult cases in which to effect a benefit are those which recur after a Wertheim operation. The fibrous tissue scars are so dense as to seem almost impervious to radiation. However, even these cases can be benefited, but we have no cure lasting more than a year. The pain in these cases is more difficult to relieve than in those that are primary. The tissues are dry and densely infiltrated with scar tissue.

Out of 25 cases treated in this series, 11 are still well. Of these 3 have been well for two years, 6 from one to two years, and 2 from six months to a year. Of the 11 clinical recoveries, there were 3 operable and 8 inoperable. Of the 3 operable cases one is well after two years, and 2 over one year. Though the cases are few, this is in itself an interesting observation, as a recurrence after operation usually occurs within the first six months.

A few of the results obtained seem to warrant individual report.

CASE I.—Mrs. S., aged forty-five, was brought to the Jewish Hospital in an ambulance, in what seemed to be the last stage of a secondary anæmia. Red count 2,400,000, marked pœcilocytosis, hæmoglobin 40 per cent., weight 72 pounds. The vagina was completely blocked by exuberant masses springing from the cervix. There was, however, no involvement of the vesicovaginal or rectovaginal septum. March 15, 1915, contrary to our usual custom, in order to more promptly control the hemorrhage, the mass was curetted away, and cauterized with the actual cautery. One hundred milligrammes of radium were buried in the crater. On March 20, the hemorrhage was entirely stopped. Radium treatment was repeated four times between that and May 17. After the last treatment there was some rectal irritation. She was sent home and told to return for treatment in about two months. Nothing more was heard from her until April, of this year, when in answer to inquiry she stated she was in excellent health, weighed 110 pounds, normal weight 125, and that she did her own housework. Aside from a slight rectal irritation she was in excellent health. She has been perfectly well for over a year.

In all of the cases classed as inoperable, the uterus was firmly fixed in the pelvis, and there was marked hemorrhage and more or less putrid

discharge. In all of these cases one of the most noticeable phenomena was the increased mobility of the uterus after the first few treatments. After more extensive radiation, the uterus again becomes more or less fixed by the new-formed fibrous tissue.

In one case we have had a recovery after a comparative incomplete series of treatment.

> CASE II.—Mrs. H., aged seventy-one, seen first May 1, 1915. Has had slight hemorrhage from the uterus for a year and a half. For the past seven months very severe. Examination shows a carcinomatous degeneration of the entire cervix, with complete fixation of the uterus. Four treatments were given in all, and at the end of that time the cervix was normal and uterus movable. The patient refused further treatment. She is still well, although more than a year has passed since the last treatment.

In our experience there has been no single case in which the radium treatment was not followed by some benefit. One of our earliest cases came into the hospital in what seemed the last stages of septic infection. The vagina was filled with great masses of carcinomatous tissue, and the odor of the discharge was terrifying. After three radium applications of 24 hours each, the discharge stopped, the foul odor disappeared and the patient began to gain in weight. She died five months later of a large perinephric abscess, but there was no return of the vaginal involvement.

Cases approaching this in severity are numerous in our series, and show that practically no case is too far advanced to be at least temporarily helped by radium treatment. In cases where there is involvement of the recto- and vesicovaginal septa great care must be exercised because of the danger of fistula formation.

Parenthetically we may here allude to an unpleasant sequel of radium therapy which we have seen in a few of our clinically cured cases. It is a pain in the rectum which occasionally becomes quite severe. It probably results from scar tissue, but this, it must candidly be said, is only a surmise.

There are, of course, many methods of applying radium to cancers of the uterus, according to the contour of the growth. We vary our methods, using for this purpose either a disc-like brass filter or one cylindrical in shape. The former is reserved for cases in which there is a broad ulcerating surface, and the latter for those in which there is a disposition to crater form.

SUMMARY

1. Radium is the method of choice in the treatment of inoperable and border-line cases.

2. Of the three operable cases treated with radium a clinical cure has been effected in each case.

3. Cases clinically cured by radium should not be subjected to hysterectomy, as the operation is difficult and dangerous.

BIBLIOGRAPHY

[1] Keetman and Harting: Behrl. Wochr., 1913, vol. xxxix, p. 1806.
[2] Degrais, P.: Ann. de Gyncol. et d' Obst., 1915, Wid. xi, p. 609.
[3] Duval, Rubens: Strahlentherap, 1914, vol. i.
[4] Kelly: Jour. Amer. Med. Assn., 1915, vol. lxv, p. 1874.
[5] Kroenig: Deutsch. Med. Wochenschr., June 26, 1913.

THE RADICAL OPERATION FOR CANCER OF THE RECTUM AND RECTOSIGMOID*

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It is my purpose in this communication to discuss briefly five problems connected with cancer of the rectum and rectosigmoid: First, operability; second, operative mortality; third, operative disability; fourth, function following operation; and fifth, permanent cure. The discussion is based on a study of 753 patients whose histories were recorded in our clinic between January 1, 1893, and December 31, 1915. Of these 430 were subjected to radical operation.

Operability.—From January 1, 1910, to December 31, 1915, 619 patients with cancer of the rectum and rectosigmoid presented themselves for examination. A radical operation was performed on 312. In 186, the disease was so far advanced that operation was not advised; in 32, operation, though advised, for various reasons was not performed; in 89, on abdominal exploration the condition was found inoperable and the operation was terminated either as an exploration or as a palliative colostomy. Eliminating the 32 cases in which operation was advised but not performed, we have 275 belonging to the group in which a radical operation was not thought possible, against 312 in which radical operation was performed, an operability of 53.1 per cent. It is interesting to note in this connection that Harrison Cripps found it advisable to perform the radical operation on only 107 of 445 patients, an operability of less than 25 per cent.

In the three years just passed—1913, 1914 and 1915—277 patients with cancer of the rectum and rectosigmoid were examined and 199 were subjected to radical operation, an operability of 71.8 per cent., the increase being due to the fact that we did not refuse radical operation because of the local extent of the disease unless it involved structures which made its eradication impossible. In 6 cases a total hysterectomy was performed coincidentally because of extension of the disease to the uterus. The posterior wall of the vagina was removed in 12 cases. In 6, a part of the posterior wall of the bladder was resected. The whole or a part of the prostate and one or both seminal vesicles were

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removed in 11. In two instances, the pelvic portion of one ureter being involved, the diseased portion was resected and the ends of the cut ureter were tied with catgut, without causing marked symptoms from the complete obstruction of the ureter. In another patient the greater part of the membraneous urethra, the prostate, both seminal vesicles and the posterior half of the neck of the bladder were involved; these were removed. The patient lived nearly three years in good health before dying of metastasis. In 5 cases one or more loops of small intestine were resected because of direct extension from rectosigmoid cancer.

Ill-advised operations added very largely to the mortality, and in many instances, had it been possible to know in advance the extent of the disease, we would not have operated. It is a fact, however, that many patients with advanced disease not only recovered from the operation but remained well, and those who survived the operation and died later of recurrence received greater palliation and longer lease of life than would have followed colostomy.

Cancer of the rectum is not prone to early lymphatic involvement, tending to remain a localized process until late. In no case was lymphatic extension alone the cause of inoperability. Some patients in whom the rectal glands were involved have recovered and remained well following the radical operation, but none of our patients in whom the inguinal glands were involved made a permanent recovery, even after the most extensive glandular excision. The most frequent cause of inoperability was local extension of the disease to neighboring organs; the next in frequency was metastasis of the liver; and the third, peritoneal and retroperitoneal metastases.

Theoretically at least, the abdominal cavity should be explored in every case of carcinoma of the rectum because of the frequency with which metastases in the liver or peritoneal cavity are to be found, and unless such an exploration be made before a radical operation is undertaken, a number of patients will be subjected to a serious and mutilating operation without the possibility of cure.

Cancers which involve the upper rectum cannot be separated surgically from cancers of the terminal sigmoid. There seems to be a marked tendency for high cancer of the rectum to invade the sigmoid and those in the sigmoid to extend into the rectum proper. Hence it may be impossible to determine whether a given growth was primary in the terminal sigmoid or in the upper rectum. It seemed wise, therefore, to classify high rectal and terminal sigmoid cancers in one group as rectosigmoid cancers. In this group the question of operability is most difficult to decide.

Operative Mortality.—The mortality of the operation itself depends, to a large extent, on what cases are accepted for radical operation and how radical an operation is performed. For example, we performed 30 radical operations by the Harrison Cripps method without a death, but the number of cases in which this operation may be applied is limited if the patients' best interests are considered. Cases which, in our early experience, we would not have considered operable, we now subject to operation for reasons already given. Again, an operation considered sufficient in the first period was not considered sufficiently radical at the later period. Of the 753 cases, a radical operation was performed in 430, with an operative mortality of 15.5 per cent. During the period from 1893 to 1910 the operative mortality was 17.8 per cent.; from 1910 to 1913 it was 17.7 per cent. with an operability of 51 per cent.

For the years 1913, 1914, and 1915, the mortality averaged 12.5 per cent., and the operability 71.8 per cent., while the operations were made more radical. Increased experience has now brought this mortality to about 10 per cent., and a wiser selection of cases for operation will still further reduce the death-rate.

Comparison of the mortality in cancer of the rectum of various clinics shows that low mortality is coincident with low operability. An operability of 25 per cent. in our clinic would have reduced the mortality to a point under 5 per cent., since it would have eliminated cases with advanced disease which give the high mortality. It is a question of an advancing frontier in which large operability gives an apparently high mortality and a low percentage of cures, with the paradox that when the total number of cases is taken into consideration it will be found that a larger number of patients have been cured. In other words, operative mortality means nothing unless the total number of cases examined is taken into consideration.

All patients dying in the hospital after the radical operation were classified, without regard to the length of time that elapsed before death occurred, as having died from operation. Many of these patients died after some weeks from nephritis, cardiovascular disease, etc., which they had at the time of the operation. However, there seems to be no way of properly estimating mortality without including them, and a certain amount of statistical hardship must be accepted in order that we may have a common basis for computation. Consent is obtained for necropsies on about 95 per cent. of the patients who die in the Clinic. In cases operated on, we make it a rule that the operating surgeon or one of the surgical assistants shall attend the necropsy in order that his exact

technical knowledge of the operative procedure may aid the pathologist in arriving at the primary and contributory causes of death.

Among the facts which were especially apt to increase the mortality was obesity, the fat patient, especially the male, giving almost a prohibitive mortality from the one-stage combined abdomino-posterior operation. However, obese patients withstood well the two-stage operation and also operations of the perineal or posterior Kraske type, though in the case of very obese individuals the colostomy itself was sometimes made with difficulty and was attended by a very considerable risk. In such patients we have not infrequently made the posterior radical operation in a single stage, without exploration or colostomy, completing the operation with a posterior anus at or near the normal situation.

The important causes of operative mortality are:

1. Sepsis, 39.8 per cent. The sepsis was due usually to soiling the wound or peritoneal cavity during the operation with intestinal contents. This occurred most frequently in cases in which the growths had caused obstruction; consequently, radical operations are seldom permissible until the obstruction has been relieved. In cases of this kind the two-stage operation proved of the greatest value. The colostomy relieved the obstruction and made possible thorough cleansing of the lower fragment, which, by reducing the infection, tended to produce more favorable conditions for operation later. The disadvantage of this method lay in the fact that the blind stump created between the colostomy and the point where the lower sigmoid was turned in behind had a tendency to develop late infections, fistulas, etc., in the posterior wound. It would appear that the percentage of deaths from sepsis was too high and undoubtedly this is true. Few of the patients in whom the growth was movable died from sepsis following operation, but we found it exceedingly difficult to prevent soiling of the wound in those cases in which the rectum was fixed and the growth had completely penetrated through the walls of the rectum, especially when this fixation took place in a situation where the peritoneal cavity was involved. This was particularly true of the rectosigmoid cases in which the operation was necessarily performed from above—cases often complicated with abscesses in the pelvis and adhesions to the small intestines. In this group the mortality was more than 30 per cent. One might well ask: Is it justifiable to attempt the radical operation under these circumstances? The answer depends upon the point of view. Colostomy in such cases is a most meager palliation and the fact remains that in

nearly 20 per cent. of such extremely advanced cases in which the radical operation was performed, a five-year cure was obtained.

2. Nephritis, 13 per cent.; usually an acute nephritis superimposed on a chronic process. Infections, hemorrhage and interference with the function of the bladder played a considerable part in its production. The post-operative subcutaneous introduction of fluids into the general circulation is most important in preventing this complication.

3. Undiscovered metastatic tumors, 10.5 per cent. Unfortunately, abdominal exploration does not always reveal such growths, especially when they are buried in the substance of the liver, by all odds the most common condition. Small areas of cancerous involvement in the peritoneum and posterior fatty tissue are also sometimes overlooked. Patients with metastatic cancer have little vitality and often die from exhaustion following an operation which would not have been performed had the true condition been known. By more thorough exploration some of these operations and deaths have been avoided, though not all.

4. Hemorrhage, 6.5 per cent. While no patient died from hemorrhage directly, two died from so-called secondary shock, due to loss of blood from poorly controlled hemorrhage. In the remaining cases in this group hemorrhage was the chief factor leading to infection and exhaustion. We have not found that extensive operations of themselves have added very greatly to the mortality unless accompanied by increased loss of blood. In other words, unless there has been hemorrhage, I have not seen shock, the patients being in excellent condition at the completion of the most formidable procedures.

Prolonged operations with great traumatism may cause shock without actual loss of blood, but the condition is the same, the blood being withdrawn from the general circulation and lying in the suddenly dilated venous trunks of the abdomen.

5. Obstruction of bowels following operation, 3 per cent. In closing the gap in the pelvic peritoneum to prevent the small intestines entering the space from which the growth has been removed, a continuous chromic catgut suture should be used. I lost two patients some time after operation from chronic obstruction of the bowels, because I had used interrupted chromic catgut sutures, and following the operation, part of the lateral wall of the small intestine had pushed through a little crevice in the suture line.

In one case death was due to the inclusion of both ureters in suturing the peritoneum to close the pelvic cavity. The ureters had been in full

view but too much of the peritoneum and lateral structures of the pelvis were taken up in the suture in the attempt to secure a firm closure.

The remaining deaths were due to exhaustion and occurred usually some days or weeks after operation.

Operative Disability.—Asepsis leads to primary wound healing. We have had patients leave the hospital with completely healed wounds in sixteen days and return to their employment in thirty days. Infected wounds were often six to twelve weeks in healing, and three or four months occasionally elapsed before the patients returned to work.

Function Following Operation.—The best function that we have been able to obtain following operation has been after the tube method of resection described by Balfour and the C. H. Mayo method of direct end-to-end union between the end of the sigmoid and the anal canal. The Weir method of invaginating the growth through the anus—amputation and direct through-and-through suture from the mucous surface—has given excellent results, but the method of invagination can be practised in only a small number of cases. The attempt to save function, however, has been one of the most common causes of technical failures resulting in sepsis and death or failure to obtain permanent cure. In order to save function, modifications were made in the operative technic resulting in a less thorough eradication of the disease. Patients, as a rule, were willing to accept a definite increase in possible mortality and a reduction of prospects of permanent cure that the function so highly desirable might be obtained.

The manner of performing colostomy does not seem to have made much difference in the ultimate functional results, but, in any event, the opening should be made well above the pudendal hair, which, when soiled, tends to uncleanliness and fecal odor. We have had good results with the Littlewood method, which places the colostomy in the waist line above the left anterior superior spine of the ilium. This obliterates the peritoneal space to the left of the colostomy and prevents the small intestine's becoming incarcerated and adherent in this situation. In two cases in our experience colostomy in the left rectus muscle was followed by obstruction of the bowels from this cause.

Mixter advises making the colostomy in the midline just beneath the umbilicus, and we have used this situation in a number of instances with satisfaction. The Mixter colostomy furnishes direct access to the lower sigmoid and rectum and facilitates cleansing, when made as the first stage of a two-stage operation. It also appears to be less liable to late infections in the blind end following the radical operation. Moreover, it rapidly terminates a midline exploration or radical opera-

tion by placing the colostomy in the upper end of the working incision, and the results are so satisfactory that we are employing it extensively.

Care in regard to diet, the development of a 48-hour habit of bowel movement and the use of a large amount of water as an enema to empty the large bowel thoroughly once in 24 to 48 hours, does much to render the management of a colostomy successful. The radical operation of Harrison Cripps, while applicable only to cancer of the low rectum and anal canal, gives marvelously good functional results. In those cases in which extensive dissections about the bladder, prostate, urethra, etc., have been made, the return of control of the bladder is sometimes slow. One of our patients lost control of the bladder to a large extent permanently, and catheter life is necessary. This patient is impotent.

Permanent Cures.—Of the 430 patients on whom a resection was done, 364 recovered from the operation. Eliminating those who were operated on less than three years ago, we have 33.3 per cent. who lived three years or more, and 28.3 per cent. who lived five years or more, after the operation. These percentages may be increased fairly to 37.5 and 35.8 per cents., respectively, by subtracting from our mortality figures the normal death-rates for corresponding ages for periods of three and five years, *i.e.*, 4.2 and 7.5 per cents.[1]

REFERENCES

Balfour, D. C.: A Method of Anastomosis Between Sigmoid and Rectum. Ann. Surg., 1910, li, 239–241.

Cripps, H.: On Diseases of the Rectum and Anus. London, Churchill, 1913, 449–515.

Littlewood, H.: Malignant Disease of the Colon: Fourteen Colectomies with Ten Recoveries. Lancet, 1903, i, 1511–1515.

Mayo, C. H.: Resection of the Rectum for Cancer with Preservation of the Sphincter. Surg. Gynæc. and Obst., 1914, xviii, 401–403.

Mixter, S. J.: Points in the Surgical Treatment of Acute Intestinal Obstruction. Surg. Gynæc. and Obst., 1915, xx, 268–270.

Weir, R. F.: An Improved Method of Treating High Seated Cancers of the Rectum. Jour. Am. Med. Assn., 1901, xxxvii, 801–803.

[1] Medico-Actuarial Mortality Investigation Table.

SARCOMA OF THE APPENDIX

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Primary malignant disease of the appendix was not recognized until Merling, in 1838,[1] described a case of a girl who died of general peritonitis as the result of perforation of the appendix. The appendix was found to be thick and firm and the seat of hard, small tumors which he decided were primary carcinoma.

Since then new cases of primary carcinoma of the appendix were reported from time to time. However, a great part of the cases published would not stand an impartial criticism.

The early instances of primary malignant condition of the appendix, including those of Merling,[2] Prus,[3] Rokitansky,[4] Kolaszeck,[5] etc., can hardly be considered as authentic cases. The microscopical examination in these cases is either lacking or insufficiently described, so that the probability of the tumor being of an inflammatory nature suggests itself. In other cases, where the author admits an involvement of the walls of the cæcum, there is reason to assume that the appendiceal tumor is secondary to that of the cæcum. In routine examination of appendices we find at times an appendix which is the seat of a somewhat circumscribed nodule, located at or near the tip; microscopically they often show nests of spheroidal cells, of rather uniform size; although they bear resemblance to carcinomatous tissue, especially when they penetrate the muscle coat, yet we are inclined to believe that they are inflammatory in origin. For, were they of neoplastic nature, they should clinically be of a more malignant type, which, however, is not the case; it is well known that they rarely infiltrate the neighboring tissues or metastasize, and when removed do not recur.

We agree with Milner[6] that the above condition of the appendix, often recorded as carcinoma, is the result of inflammatory proliferation of the adenomatous and endothelial structure of the appendix. Orth and Borst[7] have pointed out that carcinoma-like formations may follow inflammatory proliferation of such tissues.

In deciding as to whether or not tumor-like formations of the appendix are neoplastic or inflammatory in nature, one ought to take into consideration the clinical side as well, rather than rely solely upon the microscopical examination of the appendiceal tumor. Bearing this in

mind, many a case published as primary malignant condition of the appendix would undoubtedly be put into the class of the inflammatory granulomata.

Meyer [8] has recently collected 269 cases of primary carcinoma of the appendix. We believe, however, that their occurrence is less frequent than the above figures would indicate. From a collection of over 2000 appendices removed by Dr. A. P. Condon at the Nicholas Senn Hospital and other hospitals of Omaha and its vicinity, we found only one case of malignancy (sarcoma)—the case which will be described below—and five instances of tumor-like formation of the above description, which we believe are of inflammatory nature.

Sarcoma of the appendix is of great rarity. What has been said above of carcinoma of the appendix applies as well, if not more so, to sarcoma of the appendix. Jones [9] has collected 8 cases of supposedly primary sarcoma of the appendix and added a case of his own. Powers [10] reported a case since then, bringing up the total to 10 cases. The report of another case, therefore, is of sufficient interest to warrant its publication.

The history of the case is as follows:

> Mr. Keuhn, aged thirty-five, drug clerk. Family history, in regard to his present condition, negative. Had had pain and tenderness in right iliac fossa, which lasted several weeks. Personal history, well until several weeks ago; he had been in bed for a few days when Dr. A. P. Condon saw him. There was no fever; he was moderately tender in right iliac fossa; no rigidity; leucocyte count not made. Chronic appendicitis was the diagnosis and patient was operated on November 1, 1903. The appendix was enlarged to the size of a little finger; densely adherent to the wall of the cæcum; was friable, and this friability extended into the cæcum, so that in the manipulation a hole was torn into the cæcum at the base of the appendix. This was sutured and closed without drainage. He sat up in 2 weeks and went to work again at end of three weeks. The microscopical examination of the appendix proved to be sarcoma, as will be described below.
>
> About four months later Dr. A. P. Condon saw this patient; he complained of a dull aching in the right iliac fossa, and a mass the size of a split orange could be felt in the fossa; it was moderately tender.
>
> He refused an operation at this time, but several months after consented to an exploratory incision, and on June 8, 1904, a long incision to the inner side of the mass was made; this mass had markedly increased in size since seen a few months before.

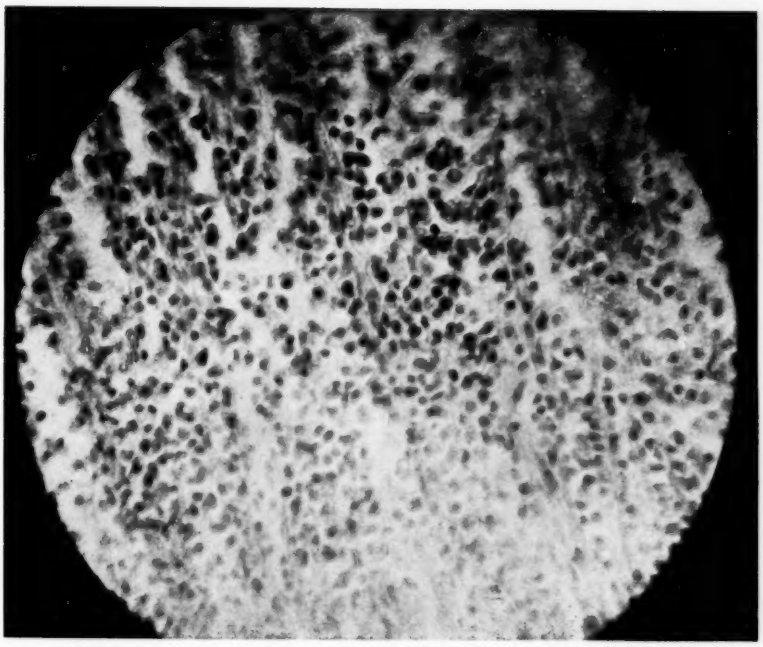

FIG. 1.—Round-cell sarcoma of appendix (high power photomicrograph).

Upon opening the abdomen there was a mass in the cæcal region the size of an infant's head, filling up the right iliac fossa, involving cæcum and ascending colon, and to this mass small intestines were adherent. The mesenteric lymph-nodes were not involved. No tissue was removed at this time, as the mass was believed to be a recurrent sarcoma. The patient died about four months after this exploratory operation.

Macroscopical Examination.—Appendix the size of the little finger, irregular and nodular Peritoneal surface presents a gray-whitish appearance. Superficial vessels are not injected.

Appendix was torn near its middle (during removal). Upon incision the lumen of appendix is found to be obliterated; the walls of appendix thick and nodular throughout its length.

The Microscopical Examination.—Sections of the appendix show columns of cells of the round-cell type containing vesicular nuclei; the cells are of irregular size, they penetrate into the muscle coat and in some places seem to disorganize the tissue. Between the cellular elements is a very fine fibrillar stroma. A great number of small, embryonic capillaries, some of which contain tumor cells, are present. The mucous membrane entirely replaced by tumor tissue.

Diagnosis.—Round-cell sarcoma, as illustrated in Fig. 1. The diagnosis was confirmed by Dr. Frank Hall, of Kansas City, and M. Petit, of Paris.

Table I shows the cases of primary sarcoma collected from the literature.

From the available description of the cases published, we would exclude the case of Glazenbrook (endothelial sarcoma), which in our estimation is, probably, an inflammatory tumor resulting from proliferation of endothelial lining of lymph-spaces. Although the case of Guilford was ruled out by Kelly and Hurdon [22] and Rolleston and Jones [23] excluded the case of Bernays, yet we believe that their criticism is not well founded. This would leave a total of 10 cases of sarcoma of the appendix in the entire literature.

Etiology.—The predisposing factor in all of the cases was inflammation. This was also true of primary carcinoma of the appendix. Direct injury being of importance in sarcoma in other localities, for instance in the lower extremities, played no rôle in the cases of sarcoma of the appendix. Only in one case direct injury associated with the tumor formation could be ascertained (Jones). This, however, does not exclude injury by fecal concretions; as in the case of Guilford, the tumor was found to be formed around such a concretion.

Age.—The majority of cases reported occurred in the second decade. The youngest case being six years (Warren) and the oldest forty-five (Carvardine).

TABLE I.

Author	Year of publication	Sex	Age	Symptoms	Findings	Type of tumor	Result of operation
Guilford [11]	1893	Female	27	Chronic appendicitis for 13 years	Appendix adherent to colon and ileum, but no involvement of same	Spindle-cell sarcoma	No recurrence.
Warren [12]	1898	Male	6	Intermittent pain and fever for a month	Glands at root of mesentery involved	Round-cell	Well after four years.
Paterson [13]	1903	Male	39	Uneasiness, occasional sharp pain in right iliac fossa for three months. Acute attack of vomiting before operation	Adherent appendix, and cæcum thickened a quarter of an inch around appendix. Autopsy showed no trace of tumor elsewhere	Round-cell	Patient died six hours after operation.
Bernays [14]	1905	Female	29	Chronic appendicitis for one year	Adjacent wall of cæcum involved	Round-cell	Two years after operation, tumor appeared in abdomen which was considered to be a recurrence.
Carvardine [15]	1907	Female	45	Chronic appendicitis for five months. Attacks of diarrhœa and pain in right iliac fossa. Frequent attacks of severe colic	Appendix adherent and friable. Neighboring glands enlarged	Round-cell	Recurrence on left side and death nine months after.
Carvardine [16]	1907	Male	..	Recurrent appendicitis....	Some neighboring glands enlarged. Appendix buried in adhesions	Round-cell	Not stated.

Stewart [17]....	1908	Male	35	Recurrent attacks of appendicitis	Head of cæcum covered with adhesions; mass friable. Appendix buried in centre	Fibrosarcoma	Not stated.
Jones [18].....	1911	Female	26	Intermittent pain in lower abdomen for four years, following injury to right side. Before operation, constant pain in lower abdomen	Appendix hard, large at middle, elastic, nodular mass invading in places the wall of the appendix	Spindle-cell	Patient well at present time (personal communication from author).
Powers [19].....	1911	Female	18	Attack of appendicitis for five weeks	.....	Round-cell	Patient died ten weeks after operation, having developed what was supposed to be a general sarcomatosis.
Wohl[21]	1916	Male	35	Chronic appendicitis.....	Appendix densely adherent to wall of cæcum; was friable, friability extending to cæcum	Round-cell	Recurrence after four months and death seven months later.
Glazebrook [20].	1895	Male	55	Chronic appendicitis.....	.....	Endothelial sarcoma(?)	Tumor found at autopsy.

Sex.—While carcinoma of the appendix was noted by Harte [24] to be more common in the female and McCarthy and McGrath [25] recently reported 73 per cent. of their 40 cases occurred in females, sarcoma was equally present in both sexes.

Symptoms and Diagnosis.—All of the cases have given symptoms of subacute and chronic appendicitis. In the more acute cases, the condition is to be attributed to the tumor, favoring the precipitation of an acute attack of appendicitis.

In the chronic cases the tumor is to be looked upon as the direct result of the chronic appendicitis, bearing resemblance to chronic inflammation of female breast or ulcer of stomach followed by malignancy. A preöperative diagnosis of sarcoma of appendix was not made in a single instance.

Treatment and Prognosis.—The treatment of most of the cases consisted of simple appendectomy and resection of the enlarged glands of the meso-appendix, when malignancy of the cæcum and the appendix was suspected by the surgeon.

The prognosis in sarcoma of the appendix is less favorable than in carcinoma. While in the latter metastasis and recurrence is the exception, in sarcoma only three cases have remained free from recurrence; four cases have developed recurrence followed by death, and one case died six hours after operation.

Conclusions.—Sarcoma of the appendix is rare, there being reported in the entire medical literature only 10 authentic cases. There is great difficulty at times to determine histologically whether or not the condition of the appendix is of chronic inflammatory or of neoplastic nature. We would therefore urge, in deciding upon the diagnosis, to take into consideration both the clinical as well as the microscopical picture. Sarcoma of the appendix (especially the round-cell type), contrary to the viewpoint held heretofore, is highly malignant.

I wish to express my thanks to Dr. A. P. Condon for his courtesy in allowing me to use his material.

LITERATURE

[1] Merling: Jour. de l'Expérience, 1838, quoted by Elting, ANNALS OF SURGERY, 1903, 561.
[2] Merling: *Loc. cit.*
[3] Prus: Crozet Thèse de Paris, quoted by Rolleston and Jones, American Journal Medical Science, 1906, 131.
[4] Rokitansky: Med. Jahrb., 13, 1867, p. 179.
[5] Kolaszeck: Arch. f. klin. Chirurg., 1875, p. 366.
[6] Milner: Münch. med. Woch., 1910, No. 14, p. 768.
[7] Orth and Borst: Quoted by Milner, *loc. cit.*

[8] Meyer: Surgery, Gynæcology and Obst., September, 1915, p. 358.
[9] Jones: Surgery, Gynæcology and Obstet., 1911, vol. xii, p. 121.
[10] Powers: New York Med. Journal, January 7, 1911.
[11] Guilford: Lancet, 1893, vol. ii, p. 241.
[12] Warren: Boston Med. and Surg. Jour., 1898, vol. 138, p. 177.
[13] Paterson: Practitioner, 1903, p. 55.
[14] Bernays: Quoted by Kelly and Hurdon, The Vermiform Appendix and Its Diseases, 1905, 742.
[15] Carvardine: Brit. Med. Jour., 1907, ii, p. 177.
[16] Carvardine: *Loc. cit.*
[17] Stewart: ANNALS OF SURGERY, 1908, p. 607.
[18] Jones: *Loc. cit.*
[19] Powers: *Loc. cit.*
[20] Glazebrook: Virg. Med. Monthly, 1895, vol. xxiii, p. 186.
[21] Wohl: ANNALS OF SURGERY, vol. lxiv, September, 1916.
[22] Kelly and Hurdon: *Loc. cit.*, 1908.
[23] Rolleston and Jones: Amer. Jour. Med. Sciences, 1906, vol. cxxxi, p. 954.
[24] Harte: ANNALS OF SURGERY, vol. xlvii, p. 976.
[25] McCarthy and McGrath: ANNALS OF SURGERY, 1914, ix, 675.

FRACTURES ABOUT THE WRIST IN CHILDHOOD AND ADOLESCENCE *

By A. C. Burnham, M.D.
of New York

While Colles's fracture has been extensively studied and is given due consideration in all modern text-books, fractures about the wrist in childhood and early life are less perfectly understood and do not receive the attention to which, in view of their frequency and importance, they are entitled. Notwithstanding the fact that Colles's fracture has been variously described by different writers and that it was probably imperfectly understood by Colles himself,[1] it is a definite clinical entity, and it is a mistake to include under the term all fractures of the lower third of the radius either with or without the involvement of the ulna.

In Colles's fracture the line of fracture is commonly from one-half to three-fourths of an inch from the styloid process running in a generally transverse direction across the bone to the ulnar margin. The tip of the ulna is usually fractured and slightly displaced. In children such a fracture is not common. On the contrary, the injury is very uncommon, the ordinary trauma such as would result in a Colles's fracture in adults resulting in another type of fracture in children, a condition requiring very different treatment based upon an understanding of the characteristic bony lesions.

The frequency of Colles's fracture in children has been variously estimated. Skillern found four Colles's fracture cases in a series of one hundred cases of fracture of the forearm in children. Some writers include all fractures of the lower third of the radius under the general classification of Colles's fracture, the percentage then being given much higher. The records of the surgical out-patient department of Vanderbilt Clinic show that during 1914 and 1915 there were 65 fractures about the wrist-joint, of which 15 occurred before ossification of the lower radial epiphysis. These fifteen cases represent injuries in patients from 3 years to 20 years of age and are the cases studied in the preparation of this paper. They include only one case which might be classed as Colles's fracture. This was a fracture of the wrist

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[1] "Mr. Colles, who had never had an opportunity to dissect a specimen of the fracture, speaks only of the symptoms and treatment. His only statement concerning the fracture itself is an incorrect one." Stimson in Fractures and Dislocations, 7th Ed., p. 311, 1912.

occurring in a chauffeur 18 years old. The remaining cases include one fracture of the scaphoid, one fracture of the radius by direct violence and 48 cases of fracture of the radius, all showing characteristic lesions of Colles's fracture.

There is but little literature on the subject of fractures about the wrist in children, but recently Vulliet has studied these fractures and has divided them into three different classes according to the lesion. His series include 29 cases which he has classified as follows:

1. *Epiphysial Separation.*—There are four of these and two doubtful cases without displacement. They occur almost exclusively after the twelfth year. The epiphysis is usually displaced backward.

2. *Fracture by "Tassement"* (Stauchungs bruch).—This is the most common type. It is usually about two centimetres above the epiphysial line and shows a typical skiagram. The anteroposterior view shows very little. Only a slight irregularity is noticed along the borders of the bone. On the other hand, the lateral view shows the radius bent but not separated, the radial fragment being deflected dorsally. There were twelve of these fractures, four of which were the low variety and resembled Colles's fracture.

3. *Fracture of Flexion.*—The line of fracture may be near the epiphysial line or it may be 3 or 4 cm. above it. They include greenstick and complete fractures, the ulna being nearly always fractured. The lower fragment is displaced to the dorsum and to the radial side.[2] There were 11 of these cases.

Skillern has recently published a paper in which he described complete fracture of the lower third of the radius with greenstick fracture of the ulna. He found 32 of a series of 100 cases of fracture of the forearm in children were fracture of the lower third of both bones, and 13 of these cases were transverse fracture of the radius with greenstick fracture of the ulna. He believes that the cause of this particular lesion is almost constantly a fall while in motion, the fracture being "a resultant of the action of gravity with momentum." The line of fracture is high and the ulna is fractured at about the same level as the radius. Most of the cases were between nine and fourteen years of age.

In the study of the fractures about the wrist before ossification of the epiphysis, there is at once apparent a clinical differentiation between those occurring before and those after puberty, and they will, consequently, be discussed separately.

Fractures in Younger Children.—From our material of the last two

[2] It is hard to understand why the flexion would not cause displacement to the palmar aspect rather than to the dorsum, as stated by Vulliet.

years it at once appears that the common lesion in young children is fracture of both bones and not fracture of the lower end of the radius. There is no separation of the epiphysis, which is in agreement with the experience of Vulliet, who found no cases under twelve years. Skillern records one case nine years of age and another eleven, but epiphysial separation before the twelfth year is most uncommon and in children under seven or eight years of age is of great rarity.

Six of the seven cases represent fractures of both bones, the other case showing greenstick fracture of the radius with the ulna apparently intact. In one case there is greenstick of the ulna (this corresponds to the type described by Skillern), the remaining cases being complete fractures of both bones.

The next most striking characteristic of these cases is that the radius is fractured considerably above Colles's site. Actually the measurements of the line of fracture average 1⅛ inches from the carpal margin on the ulna side and 1 $^{5}/_{16}$ inches from the styloid. This compares with the following figures in adults: From the styloid to the line of fracture the measurement (average 40 cases) is a little more than ⅞ inch, while from the carpal margin along the ulna side of the bone the distance is a little less than one-half inch. In 40 consecutive cases of Colles's fracture no case showed a fracture more than 1¼ inches from the styloid.

If we search for the cause of the fractures at this particular point in children, we find that the bones of children contain more cartilage towards the ends and are consequently much tougher at these points. The cancellous tissue extends much further toward the medullary canal than is the case in adults (Rixford). The history of these cases is often unsatisfactory because children have usually no clear idea of just how the accident occurred. In several of these cases the cause is given as a fall on the extended hand. In these cases the fracture is usually by compression or buckling. This is the common mechanism of fracture in young children and takes place most readily when the force is applied slowly. Where the force is exerted more quickly, one bone may be displaced and the other bone merely bent (greenstick fracture) enough to allow the displacement of the fragment as seen in the fracture described by Skillern. Where the force is applied still more suddenly and forcibly, as in falls from a height, both bones are completely fractured and displaced. It would seem then that the same force which produces Colles's fracture in adults could mechanically produce the type of fractures seen in young children. It would therefore appear that the typical fracture about the wrist in young children is fracture of both bones complete or incomplete.

It might be noted here that it is not uncommon to have the clinical symptoms of fracture of both bones and find the X-ray negative, or showing a line of fracture in only one bone. It is exactly in these bending fractures in children that the X-ray is least reliable; the diagnosis should be based on the history and localized (wincing) tenderness, the X-ray serving only as corroborative evidence.

TABLE I

WRIST FRACTURES IN CHILDREN UNDER TWELVE YEARS

No.	Name	Age	Sex	Radius	Ulna	Displacement
1	A. F.	7	M.	Complete	Complete	Dorsally, bones overlapping.
2	N. R.	11	F.	Greenstick	Intact	Anterior deviation lower fragment.
3	J. A.	9	M.	Complete	Complete	Lower fragment posteriority.
4	D. R.	19	F.	Complete	Greenstick	Anterior deviation of radius.
5	M. K.	7	F.	Greenstick	Greenstick	None.
6	E. K.	8	F.	Complete	Greenstick	Posterior deviation both bones.
7	R. A.	4	M.	Complete	Greenstick	Posterior and ulna deviation.

A glance at Table I is sufficient to show that the majority of fractures about the wrist in children are fractures of both bones. In two cases (cases 2 and 4) the anterior deviation would suggest that the injury might have been due to hyperflexion, while the remaining cases were probably caused by falls upon the palm with the hand extended.

It seems apparent that the same force applied to the palm might cause, depending upon the violence of the injury, either greenstick fracture of one or both bones, complete fracture of the radius with greenstick fracture of the ulna or complete fractures of both bones. The important point to be noted is that complete fracture of the radius is generally accompanied by fracture of the ulna, complete or incomplete, and that the occurrence of an injury to the lower portion of the forearm in children always suggests a fracture of both bones.

Fractures in Adolescence: After the twelfth year the fractures about the wrist easily divide themselves into two classes, the epiphysial separations (including fracture-separation of the epiphysis) and a second group, which might be termed the transitional group, representing lesions occurring between the sites of the fractures of childhood and those of adult life and having some of the characteristics of both types.

There were five cases of epiphysial separation, four occurring between the thirteenth and fifteenth years inclusive. As is well recognized, separation of epiphysis at the lower end of the radius is most

apt to occur during the twelfth, thirteenth or fourteenth years. Skillern gives a table of the sixteen cases in a series of one hundred cases of fracture of the forearm, the youngest patient being nine years and the oldest nineteen years, while over half occurred during the three years above mentioned.

This might be accounted for by the fact that during the early years the lower epiphysis is mostly cartilage and consequently firm and resisting. It is only after the eighth or ninth year that the epiphysis is of sufficient size to allow for the application of the necessary force to cause its separation, while in later years (from 16 years onward) the line of cartilage is very thin and so firm that the bone is often broken before separation takes place.

TABLE II

EPIPHYSIAL SEPARATION IN OLDER CHILDREN

No.	Name	Age	Radius	Ulna	Epiphysial displacement
8	M. G.	15	Separation alone	Tip fracture	Dorsally.
9	A. P.	14	Fracture-separation	Tip fracture, slightly displaced	Dorsally and radially.
10	S. N.	13	Fracture-separation	Intact	Dorsally and upward.
11	M. S.	13	Separation alone	Intact	Dorsally.
12	J. B.	20	Fracture-separation	Tip fractured and displaced	Dorsally.

All of these cases gave the same exciting cause: A fall upon the palm with the hand extended. Several were treated for a time for dislocation of the wrist. It should be remembered that dislocation of the wrist is extremely rare, while epiphysial separation is very common. The importance of complete reduction is to be emphasized, for interference with the growth of the radius is a possible result of the failure to reduce a dislocated epiphysis.

In the transitional group there are but three cases. Two of these are greenstick fractures of the radius at a point $1\ ^{7}/_{16}$ inches from the styloid (curiously enough while occurring in boys of 13 years and 14 years respectively the measurements were exactly the same). The point is considerably higher than the average line of fracture in the adult and in both of these cases the lower fragment was displaced toward the palm. In the skiagraphs these fractures are seen only with the greatest difficulty in the anteroposterior view, but are readily apparent when the parts are radiographed in the lateral diameter of the forearm. In both cases the ulna was intact. In these cases the diagnosis could be easily made by the characteristic tenderness along

FIG. 1.—Case I. Fracture of both bones in patient seven years old. Note the level of fracture and the displacement toward the radial side.

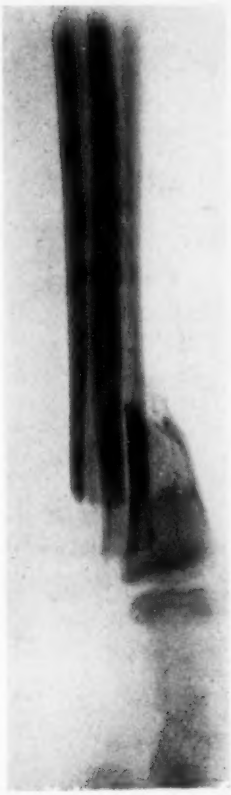


FIG. 2.—Lateral view of Fig. 1. Note the displacement backward and upward.

FIG. 3.—Case II. Greenstick fracture of the radius in a girl of eleven years. The line of fracture is evident only on close examination. This plate shows no displacement.

FIG. 4.—Lateral view of Fig. 3. Note the marked displacement as shown in the plate.

FIG. 5.—Separation of epiphysis, showing development of bones in the male. This plate is apparently negative.

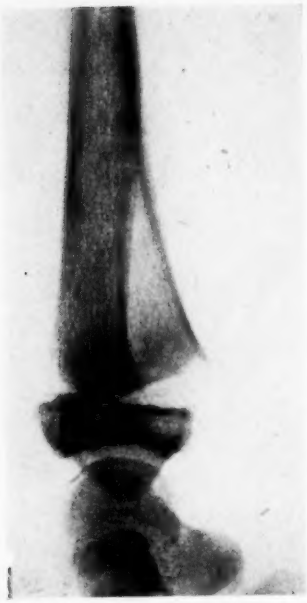


FIG. 6.—Lateral view of Fig. 5. Note how clearly the separation may be seen in this view. The ulna is intact.

FIG. 7.—Case VIII. Epiphysial separation in a boy of fifteen years. The tip of the ulna is fractured but not displaced.

FIG. 8.—Lateral view of Fig. 7. Marked displacement gives the appearance of dislocation of the wrist.

the line of fracture. They well illustrate the fallacy of depending upon a single radiograph, and this is true especially in the absence of false point of motion and crepitus.

It has been generally observed that when the classical symptoms of fracture were present almost any kind of radiograph would show the fracture, but when the diagnosis depends merely upon the characteristic history of trauma in combination with swelling and localized tenderness, it may require repeated radiographs before the line of fracture can be satisfactorily demonstrated. Indeed in some cases repeated X-ray examinations have been negative, the diagnosis finally being substantiated only after an interval of several weeks when callus formation becomes evident.

The third case in the transitional group was a fracture in a youth of eighteen years caused by cranking an automobile. This fracture was 1¼ inches from the styloid and more than ½ inch above the epiphysial line. While the ulna was intact and the fracture much higher than the average Colles's it still had the general appearance and characteristics of Colles's fracture as it is seen in adults, and might well be classed as such. During adolescence fracture of the ulna does not often occur in combination with fracture of the lower end of the radius, in contra-distinction to childhood, when it is the rule rather than the exception.

From a study of many cases of fracture about the wrist in childhood and adolescence, among which the above cited cases may serve as typical examples, it appears that the following conclusions are justified:

1. Typical Colles's fracture is very uncommon before early adult life.

2. In childhood (that is before the tenth or twelfth year) the common type of fracture about the wrist is fracture of both radius and ulna either greenstick or complete.

3. Separation of the lower radial epiphysis is of frequent occurrence during the early part of the second decade and should be carefully differentiated from dislocation of the wrist, which is so rare as to be a surgical curiosity.

4. When fracture of the radius is suspected, either in childhood or adolescence, the line of fracture should be searched for at a point considerably higher than is the case when the same injury occurs later in life.

5. In the care of fracture of the lower end of the radius in early life the frequency of the associated fracture of the ulna must be constantly borne in mind, the treatment of the condition being modified accordingly.

UNDESCENDED TESTIS*

By Daniel N. Eisendrath, M.D.
of Chicago

Theories as to Cause of Non-descent.—At the end of pregnancy the testicle should lie at the lowermost portion of the scrotum. Why it is retained at some higher point in its migration from within the abdomen through the inguinal canal until it reaches the lower end of the scrotum is not clearly understood. No single theory will explain all of the cases and in all probability a combination of causes is present in the majority. It was formerly thought that the gubernaculum testis, a combined fibro-muscular structure, played the chief rôle in pulling or guiding the testis to its final resting place. One will, however, often find a well-developed gubernaculum attached at one end to the testis and at the other to the lowermost portion of the scrotum, and yet the testis will be found lying within or just beyond the inguinal canal and cannot be brought down any further. In other cases it is true the gubernaculum is poorly developed and very short, but this is rather an exceptional finding. The view advanced by Büdinger is that the fixation of the testis by adhesions due to a fœtal peritonitis is the cause of the arrest. Others believe that a very short mesorchium or peritoneal fold suspending the testis prevents the organ from migrating. Uffreduzzi has recently attempted to explain the arrest as a reversion to the condition found in the lower mammalia. In the majority of my cases, in addition to the marked fixation of the non-descended testis and of the hernial sac which is an almost invariable accompaniment of it, I have noticed a great deficiency in the development of the arching fibres of the internal oblique muscle and a weak conjoined tendon. We know that a well-developed internal oblique acts, in the normal individual, as a sphincter, to prevent the retraction of the testis by the cremaster muscle. I simply offer this as a contributory cause and as an additional reason why operation should be done early, inasmuch as little can be hoped for from non-operative treatment as long as the musculature of the inguinal canal is so poorly developed. There is no longer any question that the vaginal process of peritoneum (see Fig. 2) does not play any part in the descent of the testis. Murray and others have shown that this finger-like process of peritoneum precedes the testis into the scrotum. In fact, one must constantly be on the watch for cases where the testis lies high up in the inguinal canal, and yet the structures of the cord pass far down

* Read before the American Urological Association, April 18, 1916.

into the scrotum and back again along the outer surface of an empty hernial sac. The arrest of the normal course of the descent of the testis is probably due to a combination of causes, no single one of which will explain every case.

Arrested or Non-descent (or retention) vs. Abnormal Descent.—It is necessary to distinguish, clinically, between an arrest of the testis in its normal course and a deviation from such a normal direction. The gubernaculum testis is like a four-tailed ribbon. The four tails unite to form a single band, which is attached to the lower end of the testis. One of the four tails is attached over the pubic region, another over Scarpa's triangle, a third to the perineum, and the fourth, which is usually the best developed, extends to the lowermost portion of the scrotum. Under normal conditions the scrotal tail is supposed to pull the testis downwards. If this does not occur we may have the testis arrested in (*a*) the iliac fossa (abdominal retention or arrest), (*b*) the inguinal canal (inguinal retention or arrest), and (*c*) retention just beyond the external ring (upper scrotal type of arrest) (see Fig. 3). Now one can readily understand that if the testis is pulled in the direction of one of the other three tails of the gubernaculum a femoral, pubic or perineal variety of abnormal descent or ectopia would be the result (see Fig. 4).

Relation of Hernia to Non-descent of Testis.—As a rule, every case of arrested or ectopic testis is accompanied by an inguinal hernia of the indirect variety, the sac of which is subject to as many variations in contents as any other inguinal hernia. In two out of my thirty-eight operations a sliding hernia of the cæcum and appendix was found. A form of hernia which occurs almost exclusively in association with non-descent of the testis is the interstitial hernia (see Figs. 5, 6 and 7). In one of my cases this was of the interparietal, and in another of the subcutaneous variety (Fig. 8).

Influence of Non-descent upon the Testis.—The investigations of Eccles [1] and Uffreduzzi [2] have clearly shown that there is a marked atrophy of the secretory functions of the retained testis. This atrophy of the spermatogenic tubules begins quite early and at puberty there is a marked difference between the appearance of sections from normal and retained testes. About ten per cent. of the spermatozoa-forming cells remain intact in the adult, according to Uffreduzzi.

Other Complications of Non-descent.—I need only mention the more important of these: (*a*) inflammation, (*b*) torsion of the testis (Fig. 9),

[1] Non-descent of Testis. Monograph.

[2] Archiv für Klinische Chirurgie, vol. 100–101.

(*c*) tumor formation. In regard to the last named there is some difference of opinion. Eccles does not believe that there is a greater tendency for such a change than in a normally placed organ. From my own experience, I am inclined to agree with the view of Uffreduzzi and others, that the non-descended testis on account of its exposed position is far oftener the seat of tumor formation than the normal organ. It was formerly believed that the reason for the development of neoplasms in the non-descended testis was on account of being more subject to trauma in the inguinal canal. During the past six months my colleague, Dr. Kolisher, has removed a large teratoma of a testis lying in the iliac fossa. At a recent meeting of the Chicago Surgical Society, Dr. D. W. Graham reported a similar case.

Indications for Operation.—There is a great diversity of opinion in this respect, but the general tendency at present is to advise operation at an earlier age than formerly. My own position is that if the testis is within the inguinal canal, or just beyond the external ring, and cannot be brought well down into the scrotum, the operation should be done at as early an age as is compatible with the general condition of the child. I have operated as early as two and a half years, and do not believe anything is to be gained by waiting until the age of ten to fourteen years, because of the well-recognized lack of development of the secreting tissues in the retained testis. If the testis lies within the abdomen and does not enter into the canal when the child coughs or strains, I also operate much earlier than formerly. One must not overlook those cases in children with well-developed cremaster muscles and large inguinal canals. The testes will often be found in the scrotum at first sight, but as soon as one begins to examine, the testis is pulled into the inguinal canal. These are not cases for surgical interference, unless the condition is associated with a fairly large hernia or should persist after puberty. Not infrequently the development of the sexual characteristics of the male is a very tardy one in cases of non-descent, and a syndrome resembling infantilism may be present as a temporary or even permanent condition. This association of hypopituitarism with non-descent of the testis was present in a marked degree in one of my cases operated at the age of sixteen, and the infantilism persists in spite of the fact that both testes now lie well down in the scrotum. I have given pituitary extract to some of these cases without much benefit. In adults I believe that we should advise operation, because of the danger of torsion and tumor formation and on account of the accompanying hernia. The prognosis as to a possible recovery of spermatogenesis is not very good, however. In my opinion this ques-

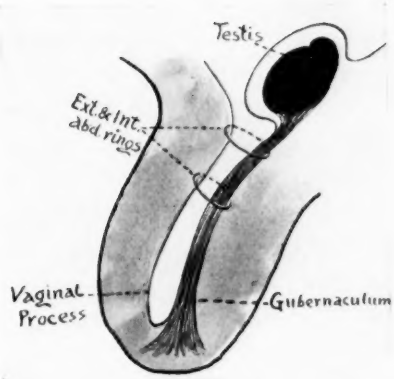


FIG. 1.—Action of normally developed gubernaculum in pulling testis down to lowermost portion of the scrotum. Note that vaginal process of peritoneum precedes testis.

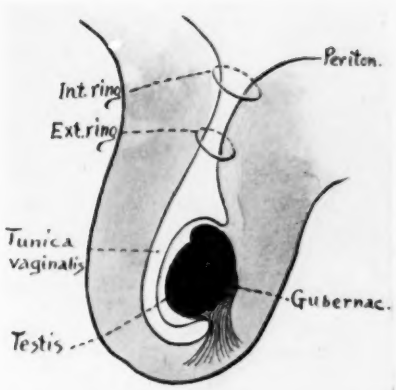


FIG. 2.—Testis in normal position at lowermost portion of the scrotum with obliteration of the vaginal process.

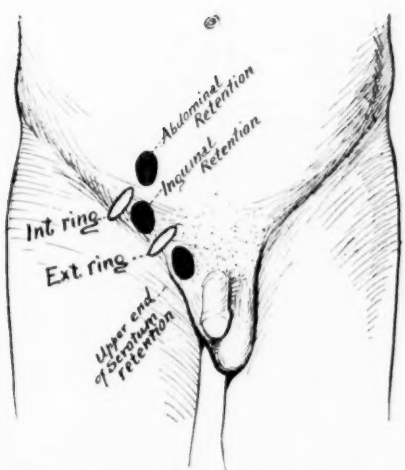


FIG. 3.—Various positions of retained (arrested descent) testis. Note location of abdominal, inguinal and upper scrotal testes.

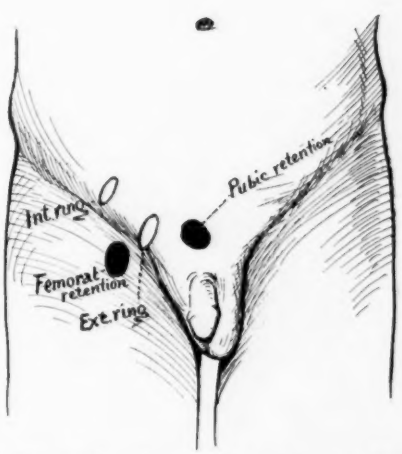


FIG. 4.—Location of pubic and femoral forms of ectopic or abnormally descended testis.

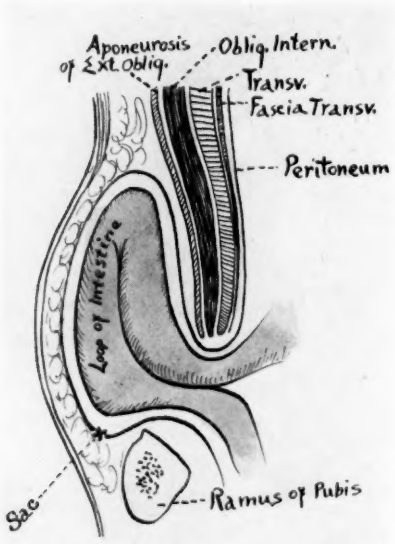


FIG. 5.—Relations (sagittal view) in subcutaneous form of interstitial hernia.

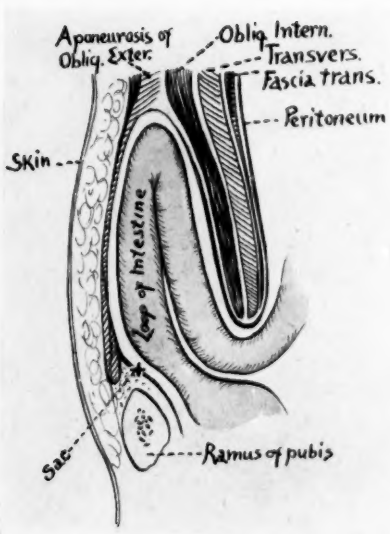


FIG. 6.—Relation in interparietal form of interstitial hernia.

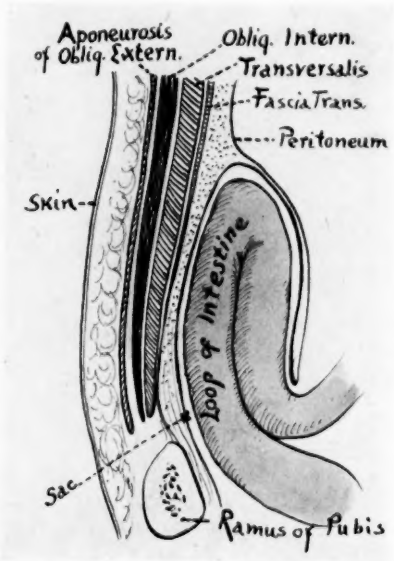


FIG. 7.—Relations in properitoneal form of interstitial hernia.

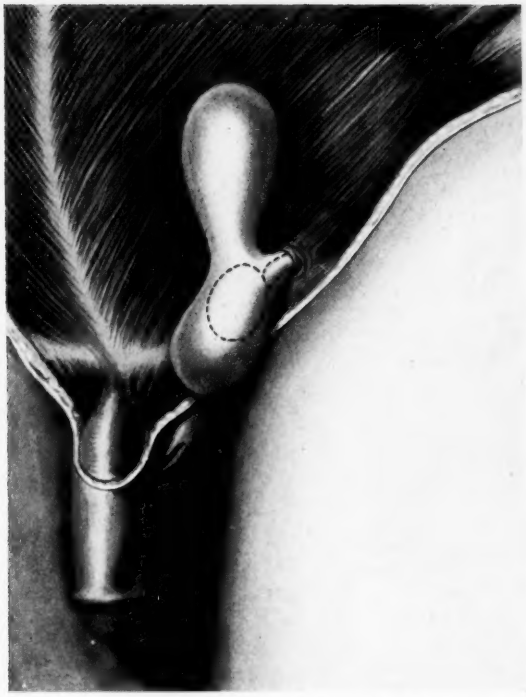


FIG. 8.—Subcutaneous form of interstitial hernia associated with non-descent of the testis (author's case). Note hour-glass form of the sac, the testis lying in the lower half, its position indicated by the dotted line.

FIG. 9.—Torsion of testis (own case). Note black hemorrhagic color of testis and epididymis.

FIG. 10.—Note faulty development of conjoined tendon and of the internal oblique. External oblique aponeurosis divided and retracted to expose unopened sac and testis (on outer aspect of sac) lying in inguinal canal.

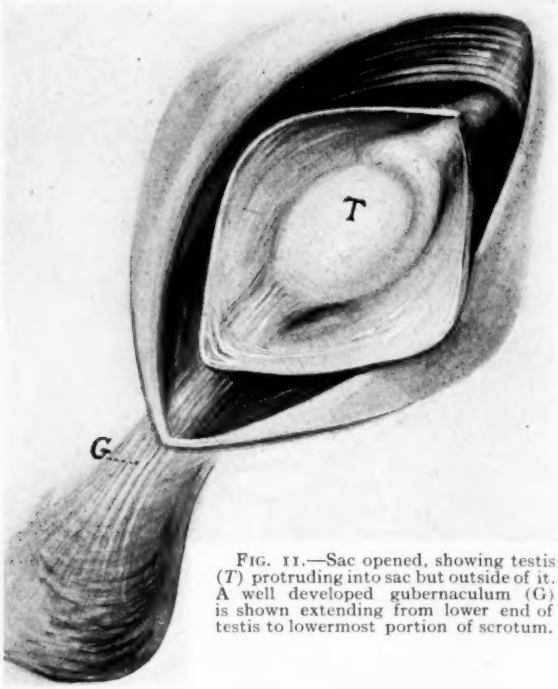


FIG. 11.—Sac opened, showing testis (*T*) protruding into sac but outside of it. A well developed gubernaculum (G) is shown extending from lower end of testis to lowermost portion of scrotum.

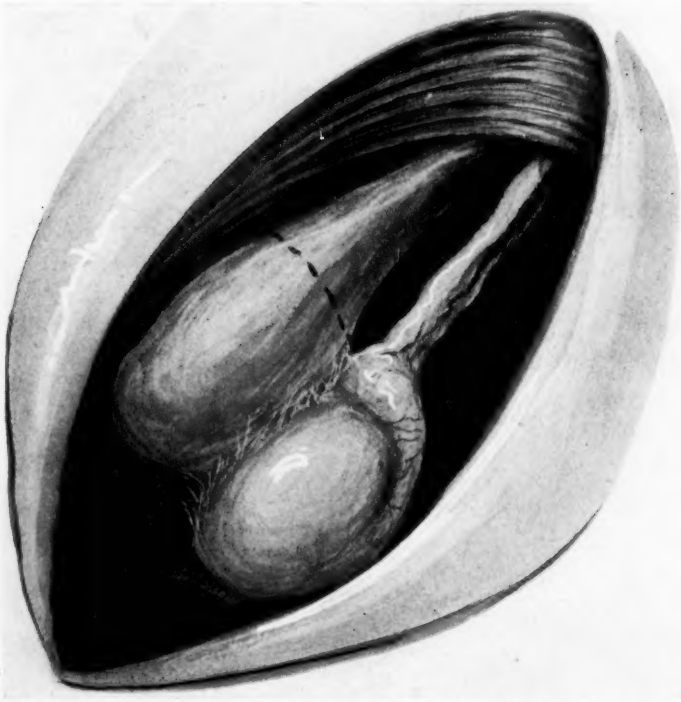


FIG. 12.—Vas and spermatic vessels separated from sac. Dotted line indicates level of division of sac before everting distal portion around testis (see Fig. 13). Gubernaculum has been divided close to testis.

FIG. 13.—Step 2. Separation of vas and vessels in direction of arrow from non-ligated proximal portion of sac. + indicates position at lowermost portion of sac to which testis must be brought.

FIG. 14.—Step 3. Testis at lowermost portion of scrotum, prevented from slipping upward by purse-string at level of external ring. Proximal portion of sac ligated high up. Remainder of operation consists in usual repair of inguinal canal without transplantation of the cord.

tion of the non-development of the spermatogenic cells is the most important one to consider in advising early operation. But little attention has been directed to a possible inter-relation between the various degrees of hypopituitarism and the non-descent of the testis. I have seen the retarded development of the male sexual characteristics or their entire absence. So often in cases of non-descent of the testis that I cannot help but feel that it is more than a coincidence.

Treatment.—The best method of operation, and one which takes into consideration the anatomical conditions more thoroughly than any other, is that first described by Dr. Arthur D. Bevan. In a series of thirty-eight operations, eight of which were bilateral, I have followed his technic and can warmly recommend it. It is hardly ever necessary if all of the steps are adhered to closely, to ligate the veins accompanying the vas. In one of my early cases it was impossible to bring the testis down into the scrotum without such ligation, and in the second case the veins were torn accidentally in a boy of five, with resulting gangrene of the testis.

In my last twenty-eight operations I have not found it necessary to ligate the vessels. The special points to which I wish to call attention, as the result of my own experience, are the extreme thinness of the hernial sac, and the small size of the structures in general in children. For this reason I now employ instruments small enough to do arterial work, and find that the handling of the tissues has been rendered far easier than before. One must always be prepared for some swelling of the testis following the operation as a result of handling the organ. This subsides within a few weeks without any special treatment. I will describe the various steps of the operation as performed at the present time, again expressing my appreciation of the work of Dr. Bevan, to whom I am indebted for the elucidation of many steps in the technic which seemed rather difficult before (see Fig. 10).

The inguinal canal is opened in the same manner as in the typical operation for inguinal hernia. The testis is found lying on the outer surface of the sac and the vas and its vessels most intimately connected with the exterior of the sac. The sac, testis and vessels are first freed from the surrounding tissues and the gubernaculum isolated, stretched out upon the fingers and carefully divided. One must not omit a search for a possible loop of the vas, extending down into the scrotum and back again, since in adults the vas often extends to a much lower level than the testis. The division of the gubernaculum (Fig. 11) renders the manipulation of the testis and sac an easier task. With fine blunt instruments the vas and the spermatic veins are carefully separated from the sac, if possible, without opening the latter (Fig. 12). The

vas and the vessels are then held aside with a catgut traction suture while the sac is opened and its contents reduced or otherwise cared for. The sac has now been opened and divided at the level indicated in Fig. 12, just above the proximal end of the testis. We now have a proximal and distal portion of the sac; the latter is now everted around the testis and its edges united with very fine catgut, preferably chromic. This eversion (Fig. 14) is necessary because of the frequent association of hydrocele of such a congenital hernial sac and this precaution is necessary to prevent a recurrence of the hydrocele. The proximal portion of the sac is best not ligated until the vessels and vas have been separated, as shown in Fig. 13, as high up behind the peritoneum into the iliac fossa as possible. One must be able, after this high separation made in the direction of the arrow of Fig. 13, to bring the testis down to the lowermost portion of the scrotum. I have never found it necessary to resort to the modifications of the operation suggested by Davison and by Wolfert. If one is patient and does not exert too much force in separating the vas and its vessels well up alongside the neck of the open, *i.e.*, non-ligated hernial sac into the iliac fossa, it is surprising how mobile the vas and its vessels become, so that one can bring the testis down to the desired point without unwise traction.

The testis is now held at the lowermost portion of the scrotum by an assistant, while a catgut purse-string (Fig. 14) suture is inserted through all of the structures at the external ring. The cord lies behind this suture which thus holds the testis and cord in the scrotum without any compression of the vas or its vessels. The remainder of the operation consists in the repair of the inguinal canal as for hernia without transplantation of the cord.

In conclusion let me urge that: 1. Cases of true non-descent or ectopic descent of the testis should be operated at as early an age as the condition of the child will permit, the lower limit being about two years. 2. Atrophy of the spermatogenic cells occurs in about ninety per cent. of the cases of retained testis, hence the necessity for early operation. 3. Tumor formation, torsion and the usual complications of the congenital hernia accompanying non-descent of the testis are not as rare as thought to be and must be taken into consideration in weighing the question of an operation. 4. Hypopituitarism is not the result of the non-descent, but an independent and not infrequent accompanying condition. 5. The operation for non-descent, *i.e.*, retained testis, has but little influence upon this lack of development of the male sexual characteristics and one should be guarded in the prognosis for such cases, as well as in the possible development of the testis after operations in young adults.

ACUTE SUPPURATIVE PANCREATITIS. GANGRENE OF THE MAJOR PORTION OF THE PANCREAS. RECOVERY. DETERMINATION OF PANCREATIC FUNCTION THREE YEARS SUBSEQUENTLY

By Robert Talbott Miller, M.D.
of Pittsburg, Pa.

(From Department of Surgery, University of Pittsburg Medical School)

The great interest in physiological chemistry and the rapid development in this field have tended, during recent years, to focus attention upon the various glands of the body and their secretions. The pancreas was early submitted to study, and since the work of Mering and Minkowski many investigators have entered this field. This work on the pancreas has undoubtedly helped to stimulate interest in the general subject, resulting in our constantly increasing knowledge of the function of the thyroid, the parathyroids, the kidney and the liver. While development in this field may seem slow and halting, yet many important facts have been established and the knowledge of them is in current use by the practitioner in his daily routine. Undoubtedly, further advances in this field will broaden our therapeutic powers greatly.

The pancreas was among the first of the glands with a highly specialized secretion to be studied. The fact that this gland has both an internal and external secretion complicates the problem. In spite of the many tests devised to determine pancreatic function and of the great study devoted to this particular gland, we are still quite unable to gauge accurately the efficiency of the pancreas; in certain instances, of apparently healthy individuals, we are even unable to affirm that any part of digestion or of sugar metabolism is being performed by the pancreas. Oser (Nothnagel's *Encyclopædia of Practical Medicine*, American Edition, Diseases of Pancreas, 1905) points out that this confusion is due in part to the power of the body to compensate for the loss of the secretion of the pancreas; the gastric juice provides for proteolysis, the bile and succus entericus, together with certain bacteria in the lower bowel, for lipolysis and fat absorption, and the salivary and certain intestinal glands for amylolysis. In addition, there is to be remembered the general physiological law, according to which the body is provided with much more pancreatic tissue than is normally required; and, furthermore, that the pancreas is usually supplied with two excretory ducts,

either of which may become occluded without necessarily producing recognizable changes in pancreatic function in every instance, since the second duct, being patent, provides for entrance of the secretion into the bowel. "A considerable portion of the gland may be destroyed by acute or chronic inflammation, by hemorrhage, necrosis, new-growth or cysts, and the remainder of the gland may perform the function sufficiently, especially with regard to the internal secretion. But this is also conceivable for the digestive action, if at least one excretory duct is available." There have been a number of cases recorded in which the gland has been almost or completely destroyed without recognizable loss of pancreatic function. Körte reported a case of necrosis of the pancreas in which the urine immediately after operation was negative, but subsequently showed a permanent diabetes. Zweifel removed all but 3 cm. of the pancreas, with the result that transient diabetes appeared on the ninth day, to disappear at the end of seven weeks. Oser lists 11 cases of complete destruction of the pancreas by acute disease (2 cases), carcinoma (8 cases) and pressure (1 case), in no one of which was there diabetes. Fatty stools are commonly associated with pancreatic deficiency, but there have been cases of practically complete degeneration of the pancreas without altered fat absorption. Oser believes that an individual may show both diabetes and poor fat absorption and yet be perfectly free from pancreatic disease. Azotorrhœa, or faulty digestion of proteid, may follow total removal of the pancreas in dogs; yet Oser cites one dog that was so treated which lived forty-one days with "severe" diabetes, but without change in the appearance or composition of the stool. He concludes that the presence of numerous undigested meat fibres in the stool is "an important feature and deserves especial mention," but that azotorrhœa alone does not imply disease of the pancreas.

In a cursory search through quite a number of the standard textbooks, it has been found that almost without exception the authors confine their discussion of pancreatic function to that portion of the article dealing with chronic pancreatitis, while little or nothing is offered in the way of study of the pancreatic function in such individuals as have suffered grave injury or complete loss of the pancreas through acute inflammatory disease save the case of Körte, cited above, which is mentioned by Opie in Osler's *Modern Medicine*.

There is, of course, a general feeling of uncertainty concerning the study of pancreatic function from a clinical stand-point. Fault is commonly found with the various tests which have been devised while, as a matter of fact, our inability to study pancreatic function accurately is

probably due in part to the compensatory action of the other digestive juices, the presence of two ducts and the fact that a relatively small portion of pancreatic tissue is sufficient to carry on the complete function. Perhaps none of these factors can be recognized, yet any one of them may alter the problem. Deaver (*Surgery of the Upper Abdomen*, 1914, p. 274) remarks that were it possible to remove the entire pancreas of a human being by successive abstractions of small pieces of the gland, the various other juices allied to that of the pancreas would probably compensate for its loss.

In view of these facts, I submit the account of a case whose pancreas was in large part destroyed by acute disease. The patient recovered to enjoy perfect health; three years later a study of his digestion and sugar metabolism showed practically no variation from the normal.

CASE I.—Hospital number 1775. Admitted April 1, 1913. Discharged May 24, 1913. Diagnosis: *Acute suppurative pancreatitis.*

Family History.—Negative.

Personal History.—Patient has always been fleshy. He has had for a long time an abnormal appetite, eating six or seven full meals a day, and he has used alcohol in excess for a long time.

Present Illness.—Of forty-eight hours' duration, beginning with severe epigastric crampy pain, which later spread over the entire abdomen. The pain soon localized in the right lower quadrant and has since remained maximum at that point. He vomited several times at the onset and has since that time been unable to retain anything. The attack was preceded by rather severe constipation for three days, his bowels not moving in spite of the free administration of purgatives.

Examination.—Well-nourished, rather obese man, evidently suffering severe pain. Temperature, 101.2°, by rectum; pulse, 116; good volume and tension; leucocytes, 17,000. Cyanosis is not present. Chest negative. The abdomen shows moderate general symmetrical distention, the walls moving somewhat with respiration. There is marked general tenderness, which is maximum in the right lower quadrant and in the right flank. Tenderness is severe in the epigastrium, where there is corresponding muscle spasm. No masses are felt. There is no dulness in either flank. On rectal examination there is found acute tenderness high on the right side, but without a palpable mass.

Diagnosis.—The error, so frequently recorded, was made again in this instance and the condition considered to be probably an acute appendicitis with spreading peritonitis. Immediate operation was made.

Operation.—Under ether anæsthesia the abdomen was opened through a low right rectus incision. A large quantity of seropurulent fluid escaped, and, in the region of the cæcum, thin bloody pus was encountered. Much to our surprise, the appendix appeared normal, excepting for injection of its peritoneal coat, which condition was also present over the cæcum and adjacent bowel. Further exploration then revealed a mass in the epigastrium, which was exposed by a high rectus incision. The mass evidently involved the pancreas, which was exposed by tearing bluntly through the transverse mesocolon and found to be tremendously swollen throughout, of a dark bluish-red color and quite friable. In the fat of the mesocolon were observed fine yellowish points, evidently foci of fat necrosis. The tissues in the region of the first and second portion of the duodenum were likewise deeply cyanotic and quite friable. The gall-bladder was markedly distended. No perforations were found in either stomach or duodenum. Free drainage was established in the region of the pancreas and the abdomen closed.

Following operation, the patient was desperately ill for forty-eight hours and then began to improve. Three weeks later a high retroperitoneal abscess was identified and opened through an incision beneath the right twelfth rib, allowing the escape of a large amount of foul-smelling pus. Irrigation of this wound brought away, from time to time, small pieces of grayish-white necrotic tissue, and, on the fourth day, there was discharged a rather large œdematous slough; the structure of this tissue was largely destroyed, but there still remained its contour and enough of its microscopic detail to identify its source (Fig. 1). The pathological laboratory (Dr. Oskar Klotz) returned the following report upon this tissue:

Macroscopic.—The specimen consisted of a loose grayish tissue $6 \times 2 \times 1$ cm. The tissue was made up of many small nodular lobules which were bound together by a very loose connective-tissue stroma. The stroma appeared in part necrotic and rather gelatinous. The small lobules looked like pancreatic tissue, but they were very loosely bound together. They were of a gray appearance and frequently showed a white granular character. The white masses looked like fat necrosis, though they were associated directly with the small lobules. True fatty tissue was not present.

Microscopic.—Sections of the tissue show a structure in which no nuclei could be made out. The entire tissue stained pale pink and was subdivided, similarly to that seen in the pancreas. There was no evidence of inflammatory reaction. The connective tissue, fat and parenchymatous tissue appeared entirely necrotic. In some places the necrosis had left the general architecture of the tissue intact, so that former small alveoli were

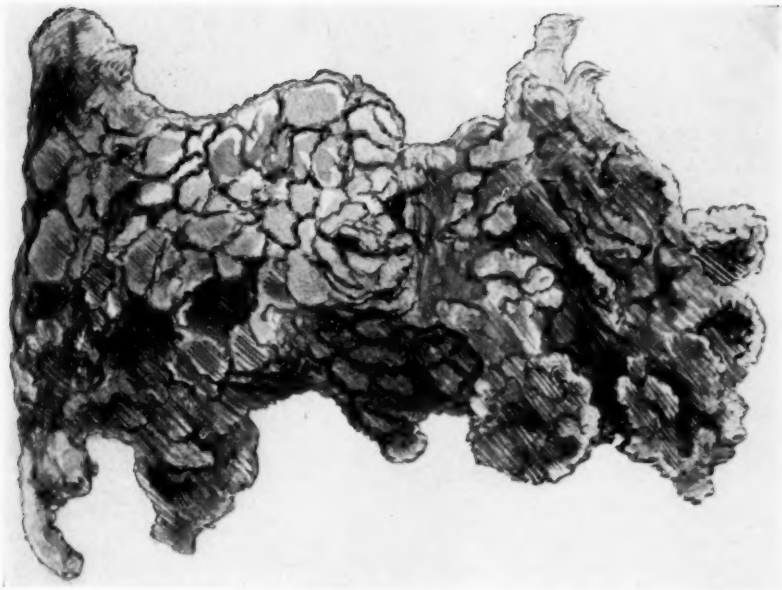


FIG. 1.—Slough of the pancreas discharged from the wound several days after the opening of a high retroperitoneal abscess, due to acute gangrenous pancreatitis. One and a half times natural size.

well bounded by connective tissue, although without evidence of any nuclei. In other places the destruction of the tissue was accompanied by a disintegration of the parts, so that nothing remained of the original characters of the tissue.

In places where the fat tissue had undergone necrosis, fine spicules were seen amidst the débris, indicating the position of some former crystals. These areas, too, showed a more intense and darker staining by hæmatoxylin, due to the deposit of calcium salts.

Diagnosis.—Necrosis of pancreas. Fat necrosis of pancreas.

Evidently the major portion of the pancreas had been destroyed and discharged from the wound. Following this, the patient made a rapid recovery and was soon discharged from the hospital.

October 15, 1915; Two and one-half years after his acute disease the patient again presented himself for observation. During this interim he had resumed his former life. On several occasions he had taken large quantities of alcohol for a more or less prolonged time and he had again established the habit of eating four or five very large meals a day. The patient applied for relief from "abdominal cramps." After two weeks in the hospital on regulated diet his condition seemed altogether normal; however, opportunity was taken to study his pancreatic function, the detail of which study follows:

October 15: Urine shows marked reduction of Fehling's solution. Positive fermentation. Quantity of sugar, 1 per cent. Patient placed on carbohydrate-free diet.

October 16: Total amount of urine for twenty-four hours, 2600 c.c. Fehling's test negative. Cammidge reaction negative.

October 17: Twenty-four-hour specimen of urine, 1900 cc. Sugar negative.

October 18: Twenty-four-hour specimen of urine, 2500 c.c. Sugar negative.

October 19: Blood sugar 0.09 per cent.

October 20: Patient given 50 gm. of glucose by mouth. Specimens of urine collected in three, six and twelve hours. Tests for sugar in these specimens all negative.

October 22: Patient given 100 gm. of glucose by mouth. Specimens of urine collected at three-hour intervals. The first specimen voided, namely, three hours after the ingestion of glucose, showed the faintest reduction of Fehling's solution, while the remaining specimens were all negative.

October 23: Patient put on Schmidt-Strassburger diet. Daily specimens of stool sent to laboratory.

October 25: Stool examination as follows: Homogeneous, normal sized stool; bile present; blood negative; parasites negative. Microscopic slide No. 1: Examination for meat fibres; no residue of meat found. Microscopic slide No. 2: Treated as follows: 1 drop 50 per cent. acetic acid

added to one drop of stool emulsion, heated just to boiling point, cover slip placed on at once and examined under the microscope. No evidence of fat, fatty acids, or soaps. Microscopic slide No. 3: 1 drop of stool emulsion placed in 1 drop of Soudan 3. Examination at once showed no evidence of neutral fats. Microscopic slide No. 4: 1 drop of stool emulsion, plus 1 drop of iodine and potassium iodide solution. Examination at once showed no undigested starch.

Summary of examination: Patient on admission showed 1 per cent. sugar in the urine. Immediately before admission he was apparently on an excessive carbohydrate diet, consisting of large amounts of bread, sugars, jellies and beer, his carbohydrate intake evidently exceeding his tolerance. This glycosuria cleared up immediately under carbohydrate-free diet. After the ingestion of 100 gm. of glucose, there was an exceedingly faint reduction of Fehling's solution; hence the patient's tolerance is just 100 gm., which is the lower limit of normal. The blood sugar, while the patient was on the carbohydrate-free diet, was 0.09 per cent., which is normal. From these facts we may conclude that his sugar metabolism is being maintained at the lower limit of normal.

As regards the digestion on the Schmidt-Strassburger diet, the macroscopic and microscopic examinations of the stools indicate very definitely that the digestion of normal amounts of meats, carbohydrates and fats is complete.

In view of the extensive involvement of the pancreas at the time of his original attack, we may be certain that such pancreatic tissue as did not slough away was subsequently markedly fibrosed. It is quite possible, then, that this individual's normal digestive balance and sugar metabolism are being maintained by other secretions than that of the pancreas, although one could not determine to what extent that portion of the necessarily sclerosed pancreatic tissue still present is able to carry on pancreatic function. It would be of great interest to study a series of cases with reference to the ultimate effect of acute destructive disease of the pancreas on its function. The writer has encountered no extensive series of this character and hence feels the above case to be worthy of record.

The writer acknowledges with thanks the help of Dr. R. R. Snowden in the determination of this patient's condition and of Dr. H. H. Permar in the preparation of the appended illustration.

AMŒBIC ABSCESS OF THE LIVER*

By Alfred C. Wood, M.D.
of Philadelphia

Abscess of the liver may result from a number of conditions. Writers on the subject mention as the more common causes, the following: Traumatism, extension from adjacent suppurating foci, parasites, gall-stones, infection through the portal vein (from appendicitis and other lesions of the alimentary tract), infection through the hepatic artery from certain septic conditions (otitis media, ulcerative endocarditis, typhoid fever, etc.), and tropical dysentery. The latter condition gives rise in a certain number of cases to the so-called amœbic or tropical liver abscesses. As the case to be reported appears to belong to this class, the other forms will not now be considered.

Members of the white races, who visit certain tropical countries, are very subject to amœbic dysentery. Although dysentery is common in both sexes and at all ages, abscess of the liver occurs chiefly in adult males. It has been stated that men are affected thirty times as frequently as women. In the absence of any explanation as to how these figures were obtained, the question arises whether this ratio may not correspond with that of the two sexes visiting the tropics. The natives are relatively immune to dysentery and hence to amœbic abscess of the liver.

Tropical liver abscess may be latent, or at least develop without any manifestations that attract attention to the seat of trouble. The usual symptoms are, in addition to dysentery (or a history of a previous attack), pain in the right hypochondrium, commonly reflected to the back and right shoulder, fever, acceleration of pulse and respiration, leucocytosis, sallow skin, furred tongue, loss of appetite, digestive disturbances, and weakness.

The physical examination will show restricted respiratory action in the right lower chest, increased liver dulness, tenderness to pressure, upper right rectus rigidity, etc. Involvement of any adjacent structure from extension of the infection will modify or add to the above, in accordance with the part affected. Examination with the fluoroscope will reveal the enlarged liver area, and more or less restriction of motion of the diaphragm on the right side.

Abscess of the liver, if not relieved, leads to a fatal termination

* Read before the Philadelphia Academy of Surgery, April 3, 1916.

from septicæmia, with or without secondary involvement of adjacent organs or cavities. We have no reason to suppose that a cure may be obtained by any other means than evacuation, either spontaneously or by surgical aid. It is stated that about 28 per cent. rupture, and that rather more than one-half of these empty into the pleural cavity or lung. Cases are reported in which the discharge took place into the peritoneal cavity, gall-bladder, stomach, duodenum, colon, and inferior vena cava. Such a case may under exceptional circumstances recover, but the risk is too great and the outcome too uncertain to permit the pus to take one of these courses.

Some form of operative relief must therefore be considered. Aspiration is recommended by some, and one gets the impression from the literature that the trocar and cannula still have a place in the treatment of these cases. While special indications must always be given due consideration, an increasing tendency is apparent, in the absence of pointing or other guide to the focus of suppuration, to open the abdominal cavity and in this way to locate and deal with the abscess in the most direct and thorough manner. Introducing a needle into the liver through the chest wall as a means of locating an abscess, unless the latter be very large, is not to be relied upon as conclusive, if no pus is found. Of course, if pus is thus obtained the diagnosis is established. It is very properly urged by some recent writers that even this exploration should not be undertaken without having made every preparation to proceed at once to secure adequate drainage if the abscess is located. The needle should invariably be allowed to remain as a guide, until the focus of suppuration has been adequately drained. The reason for this injunction will appear in the following quotation. "It is surprising how many exploratory aspirations have been made without disclosing a large abscess, and how many times, when pus is shown by aspiration, and the needle removed, it has been impossible to find the abscess at operation performed later." (W. J. and C. H. Mayo.)

A minor detail developed in this case that seems sufficiently important to record. The aspirating needle was introduced into the liver at several points, sometimes without any result, and occasionally a few drops of blood were obtained. In one or two instances, the appearance of the fluid suggested a slight admixture of pus. Dr. Austin, who was present, examined the fluid with the microscope and reported it entirely free from pus. When the abscess was finally tapped, the fluid obtained could not have been distinguished by the naked eye from blood obtained from the seat of a severe, chronic congestion, but when a drop was placed under the microscope, Dr. Austin at once reported the presence

of pus. Without this help, the search would no doubt have continued further, and the collection might even have been overlooked. On the other hand it prevented further investigation at one or two points where the blood obtained had a "suspicious" appearance. This difficulty would probably not occur in abscesses of longer standing, as the purulent characteristics would be more fully developed.

As 70 to 75 per cent. of these abscesses are located in the right lobe, and most frequently in the upper and posterior part, when exploratory puncture is decided upon, the needle should be introduced in the eighth or ninth intercostal space, in the posterior axillary line. The intelligent manipulation of the needle will be greatly facilitated if guided by visual inspection through a previously made abdominal incision.

Dependent drainage is desirable in these cases as elsewhere if it can be obtained, and to secure this it will be necessary in many cases to resect a portion of one or more ribs, usually the ninth or tenth in the axillary line. If the pleura is exposed it should be reflected upward, when possible, but if unavoidably opened, the two layers should be sutured together before proceeding to open the abscess. Whether it is advisable to suture the liver to the opening in the diaphragm or to protect the abdominal cavity by a gauze coffer dam must be decided at the time of the operation. The suture is recommended and is theoretically to be adopted, but it will not always be found practicable. In such cases proper gauze protection will be required.

In the case the report of which follows I adopted the plan of exposing the liver by an abdominal incision for the following reasons: First, the symptoms of liver abscess had existed but seven days, and it seemed reasonable to suppose that an abscess, if present, might be relatively small, hence easily missed by the uncertain method of introducing a needle through the lateral chest wall. Second, the patient appeared so ill that it would have been a serious, if not fatal, blunder to have overlooked the abscess. I was prepared, therefore, to make the most thorough exploration. Third, with proper technic, I believe it is a safer method than the blind use of the exploring needle.

The method was found to be very suitable in this case, as it is probable that either the intrahepatic or the extrahepatic abscess or both might otherwise have been missed.

The subjoined history appears to show that the amœbic infection occurred six years before the illness described. It may be assumed that the patient was the host of the amœbæ during all of this period. The symptoms of liver abscess developed three days after the beginning

of a severe attack of dysentery and seven days later the operation was performed.

It is to be noted that, although the patient has been cured of his liver abscess, the amœbiasis remains unchanged, notwithstanding the active use of emetine hypodermatically.

CASE REPORT.—A. V., male, aged thirty-three years, a sailor, was admitted on September 3, 1915, to the service of Dr. E. H. Siter, Hospital of the University of Pennsylvania, from the British Consulate, and was transferred to the medical service of Dr. Stengel. I am indebted to Dr. S. S. Leopold, house physician, and Dr. N. R. Goldsmith, house surgeon, for the following notes:

Chief Complaint.—Pain in the right hypochondrium, fever and malaise.

History of Present Illness.—Eleven days ago, the patient sailed from Liverpool, feeling well. Three days later, a very severe diarrhœa developed, lasting three days. He does not recall how often the bowels moved, but thinks it may have been 9 or 10 times during a four-hour watch. He describes the stools as liquid, grayish or brown, often frothy, but never containing blood or large amounts of mucus. Cramp-like pains were present in the abdomen; there was no vomiting at this time. Five days ago the patient became so weak that he was compelled to go to bed; he had severe abdominal pain which seemed to begin in the right hypochondrium and to radiate around to the back, up to the right shoulder and into the neck. The diarrhœa stopped at this time; the movements continued to be liquid, but occurred only about once a day. The patient states that he had a temperature of 102°, five days ago; does not know whether he had any fever before this time. He occasionally vomits large amounts of watery material; has been unable to retain anything but liquid for past five days; has never been jaundiced; complains of occipital headache. There has been no nose-bleed. The urine has a dark brown color.

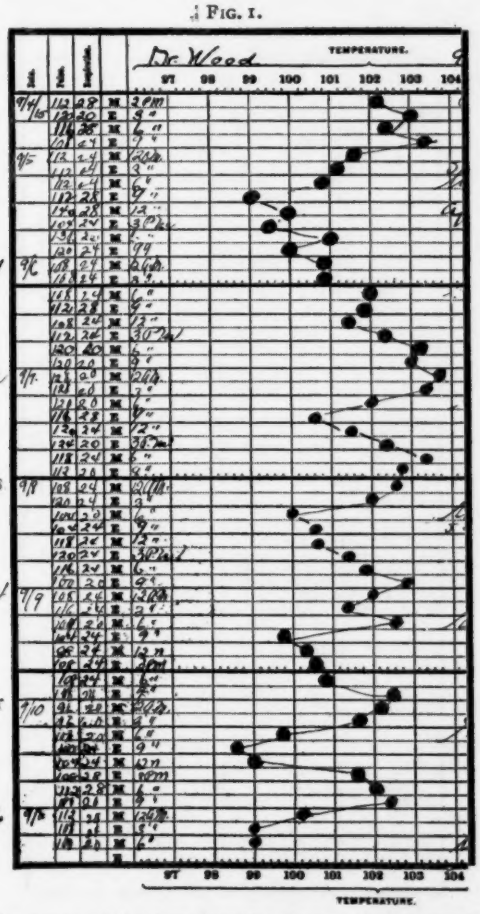
Past Medical History.—The patient says he has been all over the world. He had blood poisoning 6 or 7 times; an attack of malaria fifteen years ago, and suffered from severe dysentery when in Buenos Aires six years ago. Three or 4 other men on the ship were similarly affected. He has never had typhoid fever; does not recall any other illness.

Social History.—He has been a seaman for fifteen years, the last position held being that of second engineer on a steamship owned by the Anglo-American Oil Company. The last two voyages were between Liverpool and America. He has used alcohol and tobacco to excess; has had two attacks of specific urethritis; but says he never had syphilis.

Family History.—Negative.

Physical Examination.—The patient is a fairly well nourished, adult male, of good bony and muscular development, he has the appearance of being very ill. On admission the temperature was $102^{1}/_{5}°$, reaching $103^{2}/_{5}°$ the same evening; pulse 108 to 120; respirations 20 to 28; white blood-cells 16,400; the eyes are dull;

FIG. 1.



FIGS. 1-4 show the course of the fever from the time of admission until the thirty-second day, after which the temperature remained normal.

the breath is intensely fetid. He complains of severe abdominal pain.

The superficial vessels are not sclerosed, the radial pulse is regular, of fair volume, and the two sides are equal and synchronous.

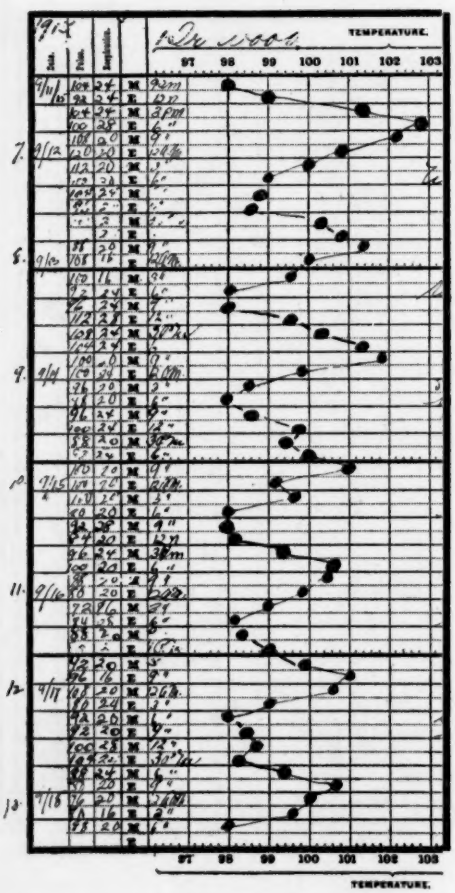
The superficial lymph-nodes: A few post-cervical glands are palpable; there is no general adenopathy.

Eyes: Pupils are equal; irides react promptly to light and to accommodation; ocular movements free in all directions; the sclera are slightly icteroid; conjunctiva pale.

Throat: The tonsils and pharynx slightly congested.

Tongue is thickly coated with a dirty, whitish-brown fur, it is protruded in the midline; there is no tremor. The breath is

FIG. 2.



intensely fetid. The teeth are in poor condition. There is marked pyorrhœa, and many decayed roots. Several teeth are missing.

Thorax is somewhat emaciated; expansion fair.

Lungs: Normal to auscultation and percussion throughout. Right base moves but 2 cm. on deep inspiration.

Heart: Apex beat not visible nor palpable. Supracardiac dul-

ness, first interspace 7½ cm.; second interspace 6 cm. Right base 4¾ cm.; left base 12 cm.; right oblique 4¾ cm.; left oblique 15 cm.; height 9 cm. The sounds are of fair quality, no murmurs are present, rate increased in frequency, second pulmonic is accentuated.

Abdomen: There is distinct rigidity in the right upper quadrant. Light palpation, even percussion, causes severe localized pain, most pronounced about 3 cm. below the costal margin, in the midclavicular line on the right side. There are no other areas of tenderness or rigidity; no fluid could be demonstrated.

Liver extends from the fifth rib downward for a distance of 19 cm. (by percussion) below the costal margin in the right nipple line. It is 7½ cm. below the ensiform, but cannot be felt.

Spleen and kidneys are not palpable.

Extremities: All reflexes are somewhat sluggish; no clonus; no Babinsky.

Blood-pressure: Systolic 118; diastolic 62; pulse-pressure 56.

Fluoroscopic examination shows arching and immobility of the diaphragm on the right side.

September 4, 1915: *Blood:* Red blood-cells 3,390,000; white blood-cells 15,800; hæmoglobin 61 per cent.; polymorphonuclears 87; small leucocytes 9; large mononuclears 2; transitionals 1; eosinophiles 1.

The Wassermann test was negative.

Urine: Slightly cloudy; dark amber; light flocculent sediment; specific gravity, 1024; reaction, acid; albumin, trace; sugar, 0; urobilin, +; faint trace bilirubin; a few hyaline casts; cylindroids, 0; much mucus; occasional red blood-cell; white blood-cells, 10 to field; moderate amount squamous epithelium, crystals, 0.

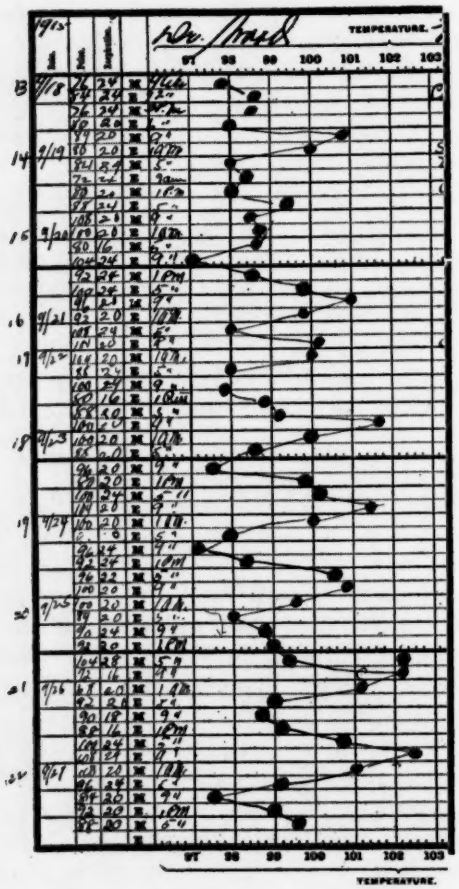
The outstanding features therefore were: following a profuse diarrhœa, pain in the right hypochondrium, radiating to the back, right shoulder and neck; fever; leucocytosis; rapid pulse; prostration; increased liver dulness; rigidity and tenderness in the right upper quadrant of the abdomen and increased arching with immobility of the diaphragm on the right side. The attack of dysentery six years before is to be kept in mind.

The diagnosis of abscess of the liver was made by Dr. J. H. Austin, with whom I had the privilege of examining the patient. Immediate operation was deemed necessary as the conditions present pointed to an extreme degree of sepsis. It may be added that subdiaphragmatic abscess, fluid in the right pleural sac as well as other causes of similar symptoms, were considered, but were ruled out by exclusion.

Operation (September 5, 1915).—Ether anæsthesia. A right, upper transrectus incision was made. The gall-bladder, stomach,

pylorus, duodenum and pancreas were normal. The liver was found much enlarged, and the upper surface more convex than normal. The appearance was such as to suggest a large abscess beneath the upper surface. After having protected the abdominal cavity with gauze pads, a large hollow needle, attached to an aspirator, was introduced into the suspicious area in different

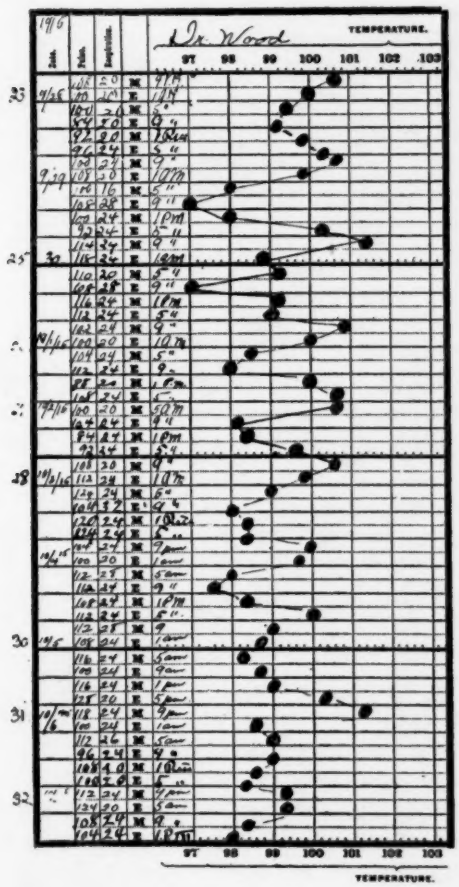
FIG. 3.



directions, but without result. Several other points were investigated in a similar way, and an effort was made to explore the upper, posterior portions by introducing the needle from the under surface, upward and backward, but no pus could be found. A hand was next passed over the right surface, from in front, backward; when the posterior surface was reached some soft adhesions were unavoidably separated, liberating a small amount of pus,

which was removed by sponging. Further exploration of this area led to the conclusion that this small collection did not account for the patient's symptoms. It was then decided to introduce the aspirating needle in the neighborhood of the site usually recommended. The exact point selected in this case was the ninth interspace in the posterior axillary line, which corresponded

FIG. 4.



with the particular area of the right lobe of the liver that appeared most in need of investigation.

The direction of the needle was determined by inspection through the abdominal wound. By this method any portion of the liver adjacent to the right lateral abdominal wall may be systematically explored. An abscess was reached at a depth of about 3 inches. The needle was allowed to remain in place, while a

section of the tenth rib was removed and the liver freely exposed. The pleura was not encountered. After proper gauze protection, the liver was opened along the line of the needle and the finger introduced, the tip of the finger barely reaching the cavity. The matter drained had the characteristic brownish-red color. A rubber tube was inserted and the tract filled with a gauze tampon. Cigarette drains were placed in the abdominal wound and the incision closed about them by layer sutures of catgut. The patient's pulse was 164 per minute after the operation, but reaction was prompt and satisfactory.

September 6, 1915: Drainage not very purulent.

September 7, 1915: Gauze drains in thoracic wound removed; a large quantity of pus escaped. Gauze tampon inserted.

September 9, 1915: Discharge distinctly bile stained to-day.

September 11, 1915: Still draining profusely; general condition good.

September 14, 1915: Gauze drains removed. Still draining copiously.

September 19, 1915: Drainage tube removed from thoracic wound.

September 23, 1915: Anterior wound rapidly improving. The posterior wound still drains profusely.

Blood: Red blood-cells 2,620,000; white blood-cells 8900; hæmoglobin 40 per cent.

October 15, 1915: *Blood:* Red blood-cells 3,100,000; white blood-cells 12,300; hæmoglobin 49 per cent.; polymorphonuclears 76; leucocytes 15; mononuclears 3; transitionals 3; eosinophiles 3.

No amœbæ found in the discharge from the liver abscess.

Fæces: Acid; bile +; no amœbæ.

October 6, 1915: Clear bile is now being discharged from the posterior wound; anterior wound is nearly healed.

October 12, 1915: Diarrhœa continues.

October 15, 1915: Temperature practically normal. Examination of pus for amœba negative.

October 19, 1915: The bowel movement was sent to the laboratory of Tropical Medicine, in charge of Dr. Allen J. Smith, and was examined by Dr. Rivas, who reported as follows: "Fæces green and liquid. *Amœba histolytica* found in both the encysted and vegetative forms." One-half grain of emetine given hypodermatically.

October 20, 1915: Emetine, one-half grain given hypodermatically to-day.

October 21, 1915: Emetine, one-half grain hypodermatically.

Urine: Amber; flocculent sediment; specific gravity 1017; albumin trace; sugar, 0; casts, —; cylindroids, —; mucus, +; red

blood-cells, —; white blood-cells, occasional; crystals, occasional.

Blood: Red blood-cells 3,530,000; white blood-cells 12,400; hæmoglobin 46 per cent.; polymorphonuclears 74; small, 26.

October 24, 1915: Diarrhœa continues. Draining profusely. Dr. Rivas reported the presence of amœba as in the previous examination.

October 28, 1915: *Blood:* Red blood cells 3,540,000; white blood-cells, 17,600; hæmoglobin 45 per cent.

November 1, 1915: Allowed up in chair to-day.

November 4, 1915: Diarrhœa continues; general condition better; drainage less profuse; incision rapidly closing. Dr. Rivas reported the presence of the encysted form of amœbæ in larger numbers than in either of the previous examinations. The vegetative form was also seen.

November 5, 1915: Emetine, gr. 1 (sterile ampoule), given hypodermatically.

November 6, 1915: Emetine, gr. ½ (sterile ampoule), given hypodermatically.

November 7, 1915: Emetine, gr. 1 (sterile ampoule), given hypodermatically.

November 8, 1915: Emetine, gr. ½ (sterile ampoule), given hypodermatically.

November 10, 1915: Drainage now contains pus, thin bile-stained material very scanty. General condition greatly improved. Diarrhœa has stopped.

November 12, 1915: Dr. Rivas found vegetative forms of amœbæ in fair numbers and a few encysted forms.

November 15, 1915: *Blood:* Red blood-cells 4,000,000; white blood-cells 17,700; hæmoglobin 74 per cent.

November 20, 1915: Patient up and walking about. No more gauze drainage.

November 26, 1915: Dr. Rivas reports the presence of amœba in large numbers in the fæces.

November 29, 1915: *Blood:* Red blood-cells 3,660,000; white blood-cells 12,600; hæmoglobin 47 per cent.; polymorphonuclears 62; small 34; leucocytes 1.

Urine: Straw; flocculent sediment; specific gravity 1018; albumin, faint trace; alkaline; sugar, 0; casts, an occasional hyaline; cylindroids, —; mucus, +; red blood-cells, —; occasional white blood-cells; epithelium, occasional; crystals, —.

December 1, 1915: Wound has fully healed, patient feels entirely well.

December 12, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 15, 1915: Emetine hydrochlor, gr. 1 hypodermatically.

December 17, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 19, 1915: Emetine hydrochlor, gr. 1, hypodermatically.

December 20, 1915: Dr. Rivas found the amœba present as in the previous examinations.

December 25, 1915: Patient exhibits no ill effect from emetine treatment. Amœbæ still present in the fæces, although patient is symptomatically entirely well, and is apparently now in good health.

January 5, 1916: Occasional slight attacks of diarrhœa.

February 1, 1916: Examination of fæces; amœbæ present.

February 10, 1916: Examination of fæces; amœbæ present; occult blood was present at every examination.

February 18, 1916: Patient has developed a scarlatinal rash (afebrile).

February 20, 1916: Diagnosed scarlet fever by Dr. Hartzell and sent to the Municipal Hospital.

The patient was returned by the Municipal Hospital to the University Hospital, April 4, having passed through an apparently typical (mild) attack of scarlet fever, followed by desquamation. He was in perfect health and appeared to be normal in every way. There had not been any tendency to diarrhœa.

He requested his discharge on the following day, to return to his former position. It is to be regretted that an examination for amœbæ was not made.

SYSTEM OF KEEPING SURGICAL RECORDS*

By Chas. H. Frazier, M.D.
of Philadelphia

In an active hospital service, it is difficult for the chief of the staff to remember in detail the immediate results of the operations which he or his assistant has performed. It is important, therefore, that some system be adopted whereby he may review in abbreviated form large series of cases and in this way see for himself where mistakes have been made, which should be corrected.

In my service at the University Hospital, staff meetings are held once a week, at which all records of patients discharged not less than seven or more than fourteen days before are reviewed. If any important facts have been omitted they are introduced and the interesting features of the case are emphasized. I find this an excellent means of impressing upon the house staff the importance of accurate record keeping.

From this record is entered in a book a summary of the case, some twenty-five cases to the page, and in this summary is the file number, name, address, diagnosis, number of days in hospital, the name of the operation, and in addition the following:

Immediate result .....
Asepsis maintained or not .....
Complications, if any .....
Comment .....
Anæsthesia .....
Anæsthesia complications .....
End result (to be filled in one year later) .....

Under comment is recorded a reason, if apparent, for any mishap, such as wound infection, fatality, mistake in diagnosis and the like, and after Codman's suggestion, these are listed as follows:

Errors due to lack of technical knowledge or skill	E-s.
Errors due to lack of surgical judgment	E-j.
Errors due to lack of care of equipment	E-c.
Errors due to lack of diagnostic skill	E-d.
The patient's enfeebled condition	P-c.
The patient's unconquerable disease	P-d.
The patient's refusal of treatment	P-r.
Delayed operation	D-o.
The calamities of surgery or those accidents and complications over which we have no control	C.

* Read before the Philadelphia Academy of Surgery, April 3, 1916.

This method invites free and frank discussions on all matters pertaining to the case, the diagnosis, selection of operation, time and preparation for operation, technic and after-care. It is at once an analytical criticism or a critical analysis of the routine work of the clinic. As a result of this discussion modifications of technic suggest themselves, means of avoiding wound complications are proposed, and other matters that make for greater efficiency adopted. Above all, it stimulates, all along the line, a livelier and keener interest in the welfare of the patient.

The efficiency of a surgeon's record need not be measured in terms of brilliancy or number of operations per day. These are ephemeral matters. The surgeon's usefulness must be measured in a more telling way; in the percentage of accurate diagnoses, properly chosen operations, percentage of recoveries, the avoidance of wound infection, wisdom in choice of anæsthesia and the avoidance of anæsthesia complications, and, last but not least, the final result.

With a summary as above outlined available, the staff can review the last series of cases, a hundred or more, in a few minutes, and can see at a glance how many or how few errors are chargeable to the service.

A SURGICAL "FOLLOW-UP" SYSTEM*

By Charles L. Gibson, M.D.
of New York
Surgeon to the First (Cornell) Surgical Division, New York Hospital

Since 1913 the following system has been employed by the First Surgical Division of the New York Hospital for the purpose of keeping its patients under observation after they leave the hospital.

At the time of a patient's discharge the following card is given him to prepare for the postal which is sent him three months later:

NEW YORK HOSPITAL
8 West 16th Street

In three months' time a postal will be sent you, asking you to return to the hospital in order that you may be examined to determine your present condition. It is very essential that you come for this examination.

The nurse in charge of the ward enters his name and address in a diary under a date three months ahead of that of his dismissal; for example, a patient leaving January 1 will be entered in the diary under the date of April 1. These diaries are kept in the respective wards.

Each week the charts of the patients discharged the previous week are gone over by the stenographer, and the following cards are filled in with the data thus obtained:

Diagnosis Appendicitis, Acute.....*History No.* 195395
Name G., Thomas.....*Age* 10. *Attend. Surg.* Dr. Gibson
Address Bergen Street.....*Sex* M. *House Surg.* Dr. Schrock
Operation Appendectomy .....
Admitted July 9, 1914.....*Discharged* July 21, 1914
Subsequent course .....

These cards are filed according to diagnosis, the classification being that of the Bellevue Nomenclature. Cases are also cross-referenced as to secondary diagnosis and death. The return notes are later written on these cards and one can readily look up the end results of any series of cases desired. Not only can the number of cases of a certain series be determined, as, for instance, a series of carcinoma of the stomach, but also the number of deaths, both in and after leaving the hospital, and the progress of the patients after their discharge. A separate alpha-

* Read at a meeting of the Practitioner's Society, March 3, 1916.

betical name file is kept. These cards contain the names of the patients and the diagnosis under which their history cards can be found.

G., Thomas .....
Acute appendicitis .....

A week before the date entered in the diary a postal is sent, requesting the patient to return the following week.

NEW YORK HOSPITAL
8 West 16th Street

.....19....

My dear M.....

Will you kindly return to Ward.....
on ....., at .....P.M.,
as Professor Gibson desires to note the progress of his patients after they leave the hospital.

Bring this card with you. If you cannot come, please write and tell us how you are.

Signed.....
House Surgeon.

At the time the postals are sent out, the cards of these patients are taken from the file and placed in envelopes bearing the name of the surgeon to whom they are to report.

When feasible, Sunday is the ideal day to ask patients to return, as many of them find it difficult or impossible to leave their work during the week. This plan, however, is better in theory than in practice, as on Sunday the wards are run with half the number of nurses ordinarily on duty, making any extra work decidedly inconvenient if not impossible, and the stenographer's services are also not then available.

Therefore, each surgeon has a separate specified time, one day each week, set apart for the purpose of examining his return cases.

On the day a particular surgeon's patients are to return, the cards of these patients are brought to the wards, and as each patient goes in for examination his card is sent in with him. After examination a note as to his present condition is dictated to the stenographer, and these notes are later typewritten on the cards which are then returned to the file.

Diagnosis Appendicitis, Acute.....*History No.* 195395
Name G., Thomas.....*Age* 10. *Attend. Surg.* Dr. Gibson
Address Bergen Street.....*Sex* M. *House Surg.* Dr. Schrock
Operation Appendectomy .....
Admitted July 9, 1914.....*Discharged* July 21, 1914
Subsequent course .....
Oct. 26, 1914. Scar firm. Good condition.

Patients whose condition is such that they must remain under observation are given a card bearing the date when they are to return for further examination,

NEW YORK HOSPITAL

Patient's name.....
Please return to ward.....
On .....
At .....

House Surgeon.

and their name and address again placed in the diary under this new date. This second entry is made by the stenographer. For instance, arrangements are made for all stomach cases to return as soon as possible after their first examination for bismuth series. Perforated ulcers of the stomach have in addition gastric analysis. These data are also placed on the history card.

Diagnosis Perforating duodenal ulcer.....*History No.* 202463
Name P., Morris.....*Age* 43. *Attend. Surg.* Dr. Gibson
Address East 5th Street.....*Sex* M. *House Surg.* Dr. Kellogg.
Operation Suturing of perforation.....
Admitted Oct. 13, 1915.....*Discharged* Nov. 13, 1915
Subsequent course .....
Feb. 14, 1916. Feels well. No pain. Eats everything.
Has gained 13 pounds.
Feb. 15, 1916. Gastric analysis:
Ewald, 20 c.c. Comb., 30 per cent.
HCl, 64 per cent. Guaiac, 0
Total, 89 per cent.
Bismuth Series: X-ray plates 23823 a., 23833 a. show slight gastric retention.

The names and addresses of all patients not returning or not writing on the specified date are given to a worker of the Social Service Department, who endeavors to find some trace of them. She reports the results of her investigation to the stenographer, who makes whatever notes necessary on the history cards.

When the above system was first installed it was proposed to have every patient return first in three months' time, and then again at the expiration of another six months. After trying this method out it was found advisable to ask only the important cases to return more than once. For example, such cases as tonsils and adenoids, cellulitis, and other infective diseases are sent for three months after their discharge, and if found in good condition are considered cured and not sent for a second time. Carcinoma cases, however, are followed indefinitely.

Every three months a meeting is called by the Attending Surgeon, when he and the staff, including the pathologist, review the previous three months' cases with their return notes. The cases are discussed, and those of special interest are clipped with colored metal signals (each surgeon having a different color, Fig. 1) in order that they may be kept under observation.

This system of following up patients has been found to work out very satisfactorily. In spite of the shifting population of New York City with its large percentage of foreigners, 60 to 80 per cent. of patients either return or send some word concerning their condition. The past three months show a record of 70 per cent., the remaining 30 per cent. bearing the note, " Moved—address unknown."

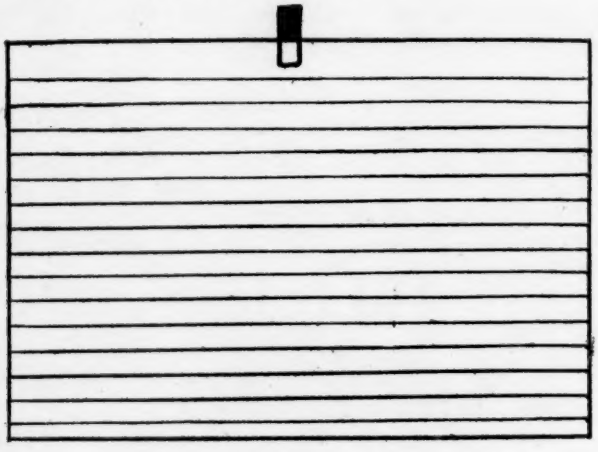


FIG. 1.

A feature of our system at the New York Hospital is our " Field Rounds." Every Monday at three, rounds are made with the attendance of the full staff, including the surgeon in charge of the Out-patient Department. Dressings are planned wherever feasible to be made at these rounds. A note is given to the stenographer in charge of the " Follow-Up " system on every patient in the hospital. Patients are told on discharge that if they ever want to see a doctor to come back for " Field Rounds " on Mondays. During their stay in the hospital they have learned the importance of this procedure and often present themselves after discharge for needed advice.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

Stated Meeting, held March 23, 1916

The President, Dr. Charles N. Dowd, in the Chair

BORCHGREVINK'S EXTENSION SPLINT FOR SPIRAL FRACTURE OF THE HUMERUS

Dr. H. H. M. Lyle presented a boy, 13 years of age, who, while wrestling, was thrown against a door and sustained a spiral fracture of the right humerus. The fracture was set at a sister hospital, but the result was unsatisfactory. After two attempts at reduction had failed, a Borchgrevink extension splint was applied, effecting a very satisfactory result.

This splint is simply a Y-shaped board, with a pulley at the lower end and a padded crutch for the axilla. Ordinary extension straps are applied to the arm and these are attached to a spreader below the elbow. From the spreader, a cord passes over the pulley and is attached to a doubled rubber tube by means of a wooden button. By shortening or lengthening the cord the desired amount of traction is obtained. If pressure in the axilla should arise, it can be relieved by passing a bandage over the crutch of the splint and around the perineum.

This simple splint gives an efficient, continuous extension, preserves the alignment and can be applied with the joints in semiflexion, thus fulfilling Zuppinger's dictum, "that the muscles must be relaxed in order to obtain efficient extension."

Borchgrevink's splint works day and night and provides extension and counter extension. An extensive experience not only in simple, but also in severe compound gunshot fractures, has led the reporter to consider this apparatus the simplest, the most comfortable and the most efficient splint for spiral and oblique fractures of the humerus.

INTESTINAL OBSTRUCTION DUE TO TUBERCULAR LYMPH-NODES

Dr. John A. Hartwell presented a boy, aged 13, who was admitted to the Cornell Division of the Bellevue Hospital on February 5 and discharged on February 22.

His illness had existed for only 5 days, nor had he ever had any

previous attacks similar to this and there was no history to indicate that he was not entirely healthy up to the beginning of the present illness.

This illness began with the typical symptoms of an acute abdominal inflammation. There was intense abdominal pain over the whole abdomen with frequent vomiting during the first day. Constipation had been marked from the first; there had been no movements from the bowels for 3 days.

Physical examination indicated no lesions outside the abdominal cavity. The abdomen was symmetrically distended to a marked degree. It was tender over its entire extent but rather more marked in the left lower quadrant. No masses could be felt. Rectal examination gave no additional information. Temperature on admission was 99°. Blood: Leucocytes, 24,000; polynuclears, 81 per cent.

The abdomen was opened immediately after admission and the following condition was found:

The mesentery contained a large number of tuberculous lymph nodes, at least two of which were ulcerated through the peritoneal covering. From each of these a firm band passed across the intestine. The lower one looped over the ileum at its entrance into the cæcum and was firmly attached to the iliac fossa in such a way as to cause a complete obstruction. The second one passed transversely across the abdominal cavity near the vertebral column and caused a partial obstruction about 10 feet proximal to the cæcum, so that there was a double occlusion of this much of the small intestine. This portion was markedly dilated and the peritoneal coat congested. Below the upper partial obstruction the bowel was not distended. The cæcum and colon were absolutely empty. Peritoneal cavity contained a small amount of blood-stained serum.

Comment.—The complete obstruction being at the ileocæcal valve, the distention had not yet reached the stomach and hence no vomiting. The backward regurgitation was also prevented to some extent by the second partial obstruction 10 inches higher up, so that the bowel above this showed no dilatation.

Dr. Hartwell called attention to the fact that this case presented two unusual factors:

1. That the obstruction was due to bands communicating with ulcerated tuberculous lymph nodes in the mesentery. There was no evidence of a tuberculous peritonitis. This in itself is a rare condition, as an acute intestinal obstruction from this cause does not as a rule occur.

2. The second point of interest is found in the fact that there were two distinct obstructions of the intestine, one at the ileocæcal junction

and the other about ten feet proximal to this, so that an actual double occlusion of this length of the intestine existed. This form of intestinal obstruction is especially severe, because the intervening loop rapidly fills with intestinal secretion, becomes very distended and there results a damage to the mucosa which permits of the rapid absorption of the intestinal poisons with early death. In this instance fortunately the boy came under observation just prior to this sequence of events and consequently made entirely satisfactory and prompt recovery.

Dr. Charles N. Dowd recalled a case in whom a band, the result of tubercular inflammation, gave great difficulty in diagnosis. This band was about ⅛ inch in diameter and 3 inches long and stretched from one loop of intestine to another. When either of these loops became obstructed violent attacks of pain followed, together with the other symptoms of intestinal obstruction. He had undergone several emergency operations for this condition in various hospitals, but each time the band escaped detection. The distended condition of the intestine probably was the cause of these failures. After a period of observation, however, a time was selected when there was no distention and the lesion was easily found and removed.

Dr. Lucius W. Hotchkiss had had a similar case in a child about 5 years old. It was a complete intestinal obstruction at the lower end of the ileum, due to a band extending from a tuberculous gland in the ileocæcal junction which completely shut off the ileum. This patient also recovered.

CARCINOMA OF CERVICAL LYMPH-NODES

Dr. John A. Hartwell presented a man, aged 59, who was admitted to the Cornell Division of Bellevue Hospital on March 15, 1916, with the following history:

About 14 years ago the patient noticed a small swelling in the left side of the neck situated about 1 inch below the anterior border of the mastoid process. The tumor very slightly increased in size during the following 12 or 13 years. About 9 months ago it began to grow much more rapidly. There was no pain connected with the tumor. There has been no loss of weight and no impairment of general health. On examination at the present time the left side of the neck is found to be occupied with a very hard fixed mass which extends from the angle of the jaw down to the clavicle, a length of about 5 inches, and follows in general the course of the great vessels. Its lateral extension is about 3 inches; it lies beneath the sternomastoid muscle; it is not adherent to the skin but is firmly attached to the deeper structures of the neck. It is

evidently composed of a large number of hard lymph nodes matted into one general mass, except that near its posterior border 3 discrete lymph-nodes from ½ to 1 inch in diameter are distinctly palpable. Examination within the mouth shows no evidence of disease. The growth is in no apparent relation with the parotid gland, unless it be by means of a low cervical portion.

On March 15 an operation was performed originally with the intention of removing the discrete lymph nodes for diagnosis. It was then found that they were so easily removed that it was determined to make the attempt to excise the entire mass, which was accordingly done with surprising ease. While dissection was rather tedious, at no time was there any difficulty in separating it from the surrounding ulcer tissue.

A frozen section of the first node removed showed it to be carcinoma. The extent of the tumor is described in the operative note as follows:

"The tumor described below occupied the side of the neck, its upper margin lying directly against the tip of the styloid process and anteriorly and posteriorly to this directly up to the base of the skull. Its lower border impinges on the pleura behind the clavicle in the line of the entrance of the great vessels into the thorax. The greater part of the growth lies beneath the sternomastoid muscle and is bounded in front by the midline and posteriorly by the vertebral fascia. The great vessels and structures of the brachial plexus are intimately adherent to it. At only one point, at its upper posterior portion, is the tumor tissue distinctly outside the gland capsule. Here it has infiltrated the muscular tissue. There is no evidence that the growth extends into the pleura or the mediastinum and nothing in the operative findings indicates the origin of the tumor, unless possibly the fact that the oldest portion of the growth seems to lie behind the angle of the jaw close to the pharynx, which may indicate the tonsils as the primary growth."

PATHOLOGICAL STUDY

Gross.—Specimen consists of a mass of lymph nodes removed from the left side of the neck. These nodes are bound together into a solid mass about 11 × 4 cm. The mass is fairly firm. On section the mass is seen to consist of discrete nodules closely bound together and these separate nodules are enlarged anywhere from 2 to 8 times their normal size. The predominant tissue in the nodules is fairly firm, slightly translucent, glandularlike tissue, greyish in color. This is dotted with small irregular ochre yellow fat areas of necrosis. In the centre of the mass is a connective tissue growth of white strands of fibrous tissue which radiate out to the periphery of the mass. One small piece of growth taken out has invaded the trapezius muscle for a short distance.

Microscopic.—The tumor cell is a large polyhedral cell with eosinophilic cyto-

plasm and a big oval nucleus staining a uniform light blue and containing one or two nucleoli. They are gathered together in rather solid collections in which the tumor cells have quite an irregular arrangement. In some of the collections there is a central area which consists of degenerated cells and fragmental nuclei. The tumor is very much like an epithelioma; there is, however, no sign of cornification (Fig. 3). The vascular supply is good, the stroma is fibrous and delicate in structure, and contains many cells whose nuclei are elongated and dark blue in color.

In one place the tumor is invading striated muscle and has caused atrophy and degeneration of the muscle fibres.

Diagnosis.—Branchiogenic epithelioma.

SARCOMA OF FEMUR

DR. JOHN A. HARTWELL presented a man, aged 18 years, who was admitted to the Cornell Division of Bellevue Hospital in October, 1915, at which time the following history was obtained:

Some time during the spring he had received a slight injury to the right knee, a short time after which a swelling appeared over the internal femoral condyle near its upper extremity. This swelling had gradually increased in size and was quite painful. An examination at that time showed a fluctuating tumor about 2 inches in diameter, involving the soft parts, but there was no apparent bony enlargement. Movements of the knee-joint were slightly restricted because of the tension of the muscles. An aspirating needle withdrew old blood.

The X-ray findings showed a shadow of decreased density in the lower epiphysis and some elevation of the periosteum.

The diagnosis " Periosteal sarcoma " was made and an exploratory operation to confirm this advised.

On opening the tumor a large amount of old blood escaped and the cavity was lined with tumor tissue resembling sarcoma. The periosteum was raised from the bone for a distance of about 3 inches and the cortex over this area was moth-eaten; there was no evidence that the tumor was growing outward from the medulla.

The microscopic examination of the tumor material showed a mixed cell sarcoma. Some of the cells were of the giant type, containing a moderate number of nuclei undergoing division. Other cells were spindle- and round-cells, both small and large.

The patient was advised to undergo X-ray treatment, which he neglected. He returned to the hospital with a very marked recurrence of the condition as shown before. The general condition had deteriorated markedly and he was suffering great pain. He declined further treatment. After 2 weeks he requested to have an amputation done because of the intense suffering.

This was done on January 15, the extremity being removed at the hip-joint by the racket incision, after preliminary closure of the femoral artery through an incision below Poupart's ligament. He made a good recovery, has steadily improved and at the present time, March 16, is in good health.

Operative Findings.—After amputation of lower extremity the site of the disease was opened. In the vicinity of the knee-joint and extending upward, to the middle of the thigh, was a fusiform swelling covered with bluish-purple skin. On opening this there was a discharge under pressure of a large quantity of old blood with recent and old clots. The surrounding tissue was markedly œdematous with greenish hue. The periosteum was raised away from the bone for a distance of about 3 inches and in the soft tissue surrounding the elevated periosteum there were spicules and granules of new bone. The process had broken through into the knee-joint which was filled with blood, but there was no actual destruction of the articular cartilage. Dissection of the vessels from the point of amputation well into the growth failed to show any involvement of inner coats.

Pathological Report.—Specimen consisted of a leg amputated at the hip. The region just above the knee joint shows a huge spindle shaped swelling. On cutting up the skin and muscles, huge blood clots are exposed just outside the femur, which are a dirty brown in color. The femur on its inside surface is denuded of periosteum, and the bony surface is rough. The bones below the knee-joint are not involved. The femur was sawn through in its sagittal plane. The entire lower end of the bone was filled with a soft, white neoplastic tissue which had destroyed all the cancellous tissue in the centre of the extremity and had eroded the cortex and periosteum through a hole about 1 cm. in diameter situated posteriorly just above the articular surface of the femur. There was considerable hemorrhage in the neoplastic tissue. The cancellous bone near the periphery of the tumor shows less destruction than the bone in the centre. There was one portion of the articular cartilage which was partially eroded by the tumor tissue, which probably gave rise to the effusion of blood into the joint cavity. The growth of the tumor is destructive, but so far had caused no enlargement or deformity of any part of the femur. The shaft of the femur was normal. The upper extremity showed a soft spot the size of a dime in the cancellous tissue. This was red-gray in color.

Microscopical.—Section through the tumor involving the cortical layer of bone, showed neoplastic growth composed of several types of cells. The most common variety was a large spindle shaped, polygonal or round cell of abundant eosinophilic cytoplasm, and a round or oval nucleus which took the basophilic stain with varying degrees of intensity. The cells lay closely packed together in a chaotic and irregular arrangement, and almost entirely filled the space between the bone trabeculæ. The picture was suggestive of a malignant sarcoma. Besides the mononuclear cells were numerous giant cells which could be roughly divided into two main types. Those in the central portion of the tumor showed

FIG. 1.—Mixed-cell sarcoma from the medullary tissue of the femur, showing giant cells of both the benign and malignant type.

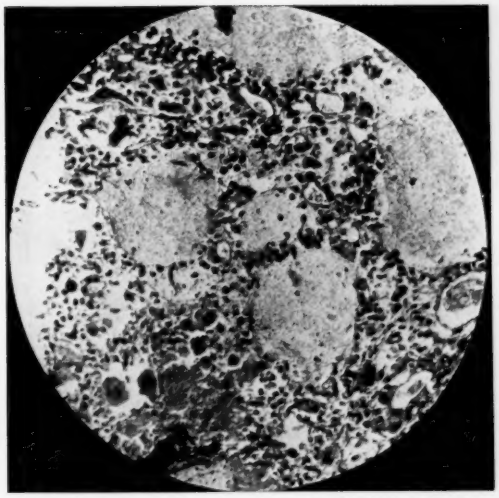


FIG. 2.—High power of a portion of Fig. 1 showing the intimate structure of the two types of giant cells.

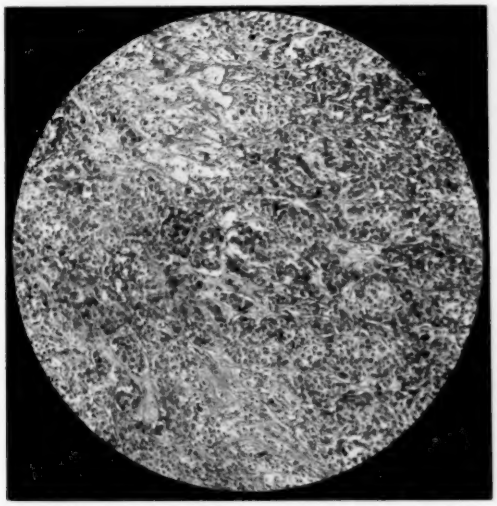


FIG. 3.—Branchiogenic epithelioma showing the squamous type of the cells without cornification.

numerous small nuclei, oval in shape and varying in number from 15 to 40, grouped in the central portion of a huge, irregularly formed, eosinophilic piece of protoplasm. They were like the giant cells found in specimens of epulis. The other giant cells were smaller, irregularly shaped, contained huge round or deformed nuclei about 2 to 5 in number. These were large in proportion to the amount of cytoplasm, and were sometimes arranged so as to form a horseshoe. These were the giant cells so often seen in malignant sarcomata. In this specimen they were found near the cortical portion of the bone, more than elsewhere, but contain only a few red cells. The blood-vessels are distended, and there are a few hemorrhagic areas. The connective tissue is scarce, and for the most part fibrillar. The bone, except in the central portion where it is undergoing lysis by the tumor cells, is normal (Figs. 1 and 2).

Diagnosis.—Giant-cell sarcoma of femur.

In presenting this case Dr. Hartwell said that he wished to call attention to certain elements in it which were of great importance.

1. The fact that the X-ray failed to show any involvement of the bone contour which is usually present in sarcoma arising within the medullary cavity. Such growths ordinarily produce an expansion of the cortex of the bone and do not penetrate the structures into the surrounding tissue, so that the X-ray gives a definite fusiform enlargement of the bone.

2. Another point to be emphasized is the fact that most of the tumors arising in the medullary cavity are of the comparatively benign myeloma type with innumerable giant cells, each containing a very large number of small nuclei. Such tumors belong to that class which may be cured by incision and thorough curettage of the bone cavity. This tumor contained many of these, but also contained the malignant type of giant cell with comparatively few nuclei, large in size and division.

The diagnosis of periosteal sarcoma was made in this case because of the failure of the X-ray to show the disease within the bone cortex, and because at operation the growth was immediately beneath the periosteum and did not seem to show any communication with the medullary cavity.

In recent writings, the comparatively non-malignant myeloma has been especially emphasized at the expense of the malignant medullary sarcoma, though the German writers have always recognized the fact that the bone marrow may give rise to both malignant and benign tumors.

It is too early to draw any conclusions as to the ultimate outcome in this patient but there seems to be a fair chance that the tumor will not prove to have the same power of general metastasis which the periosteal sarcoma possesses.

RESECTION OF PYLORUS FOR ULCER

Dr. George Woolsey presented a man, 49 years of age, who was a patient on the Medical Service of Bellevue Hospital for 3 weeks prior to January 6, 1916. His trouble began in July, 1915, by vomiting, 4 to 5 hours after eating, but only in the morning. A month later he noticed pain, mostly in the lower abdomen, which increased and was steady and dull, with occasional attacks of cutting pain. It was not relieved by food but diminished by rest and vomiting. The vomiting continued 3 to 4 times a week. There was no pain after eating. He had anorexia and had lost 25 pounds in 4 months. Wassermann negative. Hæmoglobin, 60 per cent. The X-ray showed "considerable residue to the left of median line 7 hours after ingestion of bismuth. A marked defect on the lesser curvature suggests carcinoma of the pylorus, involving the lesser curvature." This with the appearance of the man and his symptoms led to a provisional diagnosis of gastric cancer. The Ewald meal, however, showed total acid .76, free hydrochloric .42, and no blood. The fractional stomach tests, every 15 minutes, showed hyperacidity.

He refused operation and after his discharge felt quite well, while not working, and gained 8 pounds in 3 weeks. When he began to work the symptoms returned and increased in severity. He had vomiting after eating any food, and constant pain, worse 1 to 2 hours after eating, and relieved by vomiting. He thought he vomited more fluid than he ingested, and noticed no blood in the vomitus. The pain was now principally epigastric and not radiating. Examination of the stomach contents showed hyperacidity and retention of foodstuffs.

Operation, March 6, 16 days ago. Findings: Pyloric end of stomach very adherent posteriorly, especially near the lesser curvature. Two to three inches proximal to the pylorus is a large indurated mass on the posterior surface of the stomach, adherent to the mesocolon and pancreas. The lesser omentum, opposite this area, was much thickened and adherent. There were many enlarged, flattened, soft glands along both curvatures and in front of the pancreas.

As nothing short of resection was indicated, this was done by the Billroth II method. In freeing the stomach from the adherent mesocolon the ulcer was opened, its base being formed by the mesocolon. It was about the size of a dime. A short loop gastrojejunostomy was made with two rows of No. 0 chromic gut sutures, the jejunum being sutured to the anterior surface of the stomach as there was more room here than posteriorly. The stump of the duodenum was sutured to the exposed area of the pancreas. One-third or more of the stomach was

resected. The post-operative course was without incident. Primary union. The patient has already begun to put on weight, though on a rather strict diet. There is no pain or discomfort in the stomach. The X-ray shows that the stomach functionates well.

Owing, probably, to the distance of the ulcer from the pylorus and to early adhesions, this patient never presented the typical symptoms of ulcer, but the atypical continuous symptoms of a complicated ulcer, which quite closely resembled those of carcinoma.

PERFORATED GASTRIC ULCER-SUTURE. RECURRENCE OF ULCER. GASTRO-ENTEROSTOMY. HEMORRHAGE. TRANSFUSION. GASTROTOMY

DR. WOOLSEY presented a man, 31 years of age, who was admitted to Bellevue Hospital November 1, 1915, in whom, about 17 months before, a perforated gastric ulcer, ¼ inch in diameter and 1½ inches proximal to the pylorus, on the anterior surface of the stomach, had been closed by suture, without gastro-enterostomy, at the Hudson Street Hospital. He was free of symptoms until about 5 months ago, since when he has had a feeling of heaviness and at times a burning or griping pain in the epigastrium, usually before eating and relieved by food or vomiting. Occasional vomiting occurs about 2 hours after eating and the vomitus is sometimes like coffee-grounds. He has frequently noticed tarry stools, he has lost weight and for the past three weeks his appetite has been poor and the bowels very constipated.

There was marked resistance over the upper right rectus muscle and considerable tenderness over the entire epigastrium. No mass was felt. Ewald test meal gave, amount 600 c.c., total acid .70, free hydrochloric .50, no blood. The X-ray showed a persistent defect in the region of the pylorus, most marked along the lesser curvature, suggestive of ulcer. Also a 6-hour residue.

At operation, November 10, 1915, the pyloric end of the stomach was found quite adherent by bands to the anterior parietal peritoneum and to the lower edge and under surface of the liver. A small hard induration a little proximal to the pylorus was taken to be the scar of the healed ulcer. Posteriorly the pylorus and the first portion of the duodenum were indurated and very adherent to the indurated pancreas behind, presenting an ulcer, probably duodenal. Procedure: After freeing the adhesions a posterior short loop gastrojejunostomy was made with two rows of No. 0 chromic gut sutures. The pylorus was functionally excluded by infolding, by three rows of chromic mattress sutures.

Post-operative course: On the fourth day after operation the temperature dropped to subnormal, he had air hunger, vomited a small amount of new and old blood and soon after had a large black, tarry stool. He was given morphine and proctoclysis. Two days later he felt well and hungry, but was very pale and weak. Hæmoglobin 55 per cent., red cells 1,600,000. There was primary union when the sutures were removed on the sixth day. Seven days after operation he again showed symptoms of hemorrhage and was given morphine, horse serum and hypodermoclysis. He vomited but little and continued to pass tarry stools. Nine days after operation his hæmoglobin was 10 per cent., the blood-pressure was too low to count, he was drowsy and scarcely conscious, so that he was transfused by Dr. Lindeman, who gave 1100 c.c. by his method. When the patient had received 480 c.c. consciousness returned, and after 1100 c.c. he looked and felt like a new man. I operated immediately and opened up the old incision. There were no adhesions or induration about the gastro-enterostomy on the outside. The stomach was opened and the stoma admitted more than two fingers easily and appeared entirely healed. There was no ulcer and no hemorrhage at the site of the anastomosis. The pylorus was narrowed so as not to admit the tip of the finger. The small intestine appeared full of dark clots. The following day there was a slight hemorrhage with the vomiting of a little blood, though a locked suture of chromic gut had been applied around the inner surface of the stoma to prevent the possibility of hemorrhage from this source. There was no further bleeding evident. Convalescence was interrupted by the breaking down of the incision, after union, and the formation of a gastric fistula, which closed spontaneously, after a time, without further operation. In this connection it is to be noted that the inner layer of chromic gut sutures was applied to the wound in the stomach with the edges everted instead of inverted, as I usually do. The breaking down of the incision wound resulted in a ventral hernia. On December 10, 1915, just one month after the first operation, the hæmoglobin was 90 per cent. and the red cells 4,500,000. He has since been operated on for a left inguinal hernia of long standing.

The interesting points in this case are:

First. The recurrence or formation of a posterior duodenal ulcer after suture of a perforated anterior gastric ulcer, without gastro-enterostomy. If gastro-enterostomy had been added it is very probable that the second ulcer would not have formed, another reason for doing it after suture of a perforation, if the patient's condition justifies it.

There was a moderate degree of pyloric stenosis following the suture and healing of the ulcer.

Second. The life-saving result of the direct transfusion of blood. I have seen this in several other gastric cases.

Third. The hemorrhage evidently came from the ulcer and not from the gastro-enterostomy. The greater part of the blood was passed by the bowel, the relatively small amount that was vomited entered the stomach either through the imperfectly occluded pylorus or through the stoma or through both. This case is another example of the fact, which von Eiselsberg emphasized in his paper in London in 1914, that neither gastro-enterostomy nor pyloric exclusion will surely prevent hemorrhage from an ulcer, but may even provoke it.

Dr. Frank S. Mathews said that recently he attempted to excise a large ulcer that had perforated into the pancreas and attempted a suture without doing a transgastric resection. After partial suture, he found that this method would pretty surely close the pylorus almost completely. It seemed to him that in similar cases, it would be wiser to begin the operation with transgastric resection in mind rather than excision. The excision will surely result in a much deformed stomach.

Referring to the second case, he had performed four anterior gastro-enterostomies within recent months. Some were for carcinoma where resection was done and others where the disease was too extensive for excision. In each case, the loop of small intestine, taken at some little distance from the duodeno-jejunal junction, had been brought up in front of the transverse colon but without compressing it. Before closing the circle of sutures in the gastro-enterostomy, he had loosened the clamp on the jejunum and dropped a half of a Murphy button into the oral and aboral segment of the gut. After concluding the gastro-enterostomy, an entero-anastomosis was made by snapping together the halves of the Murphy button after making a cut a half inch long in the wall of the gut. This procedure adds but a couple of minutes to the length of the operation and avoids the possibility of vicious circle from duodenal distention. He was not advising anterior gastro-enterostomy as preferable to posterior gastro-enterostomy but simply suggests its use where the posterior wall is either involved in the disease or difficult to get at.

MUCOUS MEMBRANE PLASTIC AFTER REMOVAL OF EPULIS

Dr. John Douglas presented a boy 16 years old, from whom an epulis had been removed 5 months ago. The tumor had been present for 3 years, was slowly increasing in size, was about 1.5 cm. in diameter,

and was situated just below the roots of the left lower lateral incisor and canine teeth. It was hard in consistency and pale in color and evidently of a benign nature.

Its removal together with the underlying periosteum, laid bare the bone and destroyed the normal gingival tissue covering the roots of these teeth. To protect the teeth a flap of mucous membrane with the submucous tissue was dissected from the lower lip. The broad base of the flap was downward where the lip joins the gum, its apex about 1.5 cm. wide just inside the vermilion border of the lip. This flap was swung around and sutured into the defect caused by the removal of the epulis, its apex being fastened by a silk suture passed through each corner and tied around the teeth. The mucous membrane was easily brought together to close the defect on the inner surface of the lower lip, caused by the removal of the flap.

The present condition of the patient, 5 months after the operation, shows almost no retraction of the flap, which has shrunken down over the roots of the teeth so as to look almost like normal gum tissue.

VENTRAL HERNIA

Dr. Alexis V. Moschcowitz presented a woman, now twenty-six years of age, who was admitted to Mount Sinai Hospital November 4, 1912, with the diagnosis of acute intestinal obstruction. A more definite diagnosis could not be made; but the few existing physical signs led to the belief that the seat of the obstruction was located in the left half of the transverse colon. On exploration there was found a perfect example of that type of intestinal obstruction, fully described by Payr, namely, of dense adhesions between the left half of the transverse colon and upper half of the descending colon, with involvement of the splenic flexure; the descending colon was completely collapsed; while the proximal part of the transverse colon and the ascending colon were distended. In order to obtain proper exposure he added a transverse incision, so that the incision finally resembled an L. The adhesions were separated with considerable difficulty, but when finally accomplished gas passed freely into the descending colon and sigmoid flexure. Perfect primary union was obtained throughout the incision. Patient was discharged November 18, 1912.

At the present time (approximately three and one-half years after operation) the transverse part of the incision is healed perfectly solid, but the vertical part of the incision has dilated and in fact is the seat of a ventral hernia. He presented this case as a further argument in favor of transverse incisions.

TUMOR WITHIN LUMEN OF SMALL INTESTINE

ORTHOSTATIC ALBUMINURIA

DR. MOSCHCOWITZ presented a woman, forty years of age, who was referred to him about a month ago for operation for ventral hernia, the result of an operation for acute gangrenous appendicitis with abscess, and which took place September 15, 1914. The preliminary examination revealed, in addition to extreme adiposity, a huge ventral hernia, with adherent contents, and a hernial ring approximately five inches in diameter. The urine was so loaded with albumin that it practically boiled solid. Her blood-pressure was very high for her age, namely, one hundred and seventy. He informed her family physician of these facts, and declined operation temporarily. Her physician, a very careful man, was rather surprised at this decision, because he had examined the urine of the patient only a short while before, and found it to be normal; on the following morning he again examined it, and, much to the reporter's surprise, he again found it to be normal.

Finally he consented to operate and the patient was admitted to the Har Moriah Hospital, where it was found that the urine was again loaded with albumin; on rest in bed the albumin disappeared until merely a trace was found. When, however, the patient was allowed to be up and about again large amounts of albumin were found. The functional capacity was tested with phthalein, and was found to be normal.

He referred this case to the indefinite group of orthostatic albuminuria, and presented it particularly in order to obtain an expression of opinion as regards the indication for operation. The following points are to be particularly emphasized: 1. The presence of large amounts of albumin in the urine. 2. The variability in the amount of the albumin. 3. The high blood-pressure. 4. The adiposity of the patient. 5. The size of the hernia.

ACUTE INTUSSUSCEPTION (ENTERO-ENTERIC) DUE TO TUMOR WITHIN THE LUMEN OF THE SMALL INTESTINE

DR. L. W. HOTCHKISS presented a man, 19 years of age, who was admitted to Bellevue Hospital in September, 1915, suffering with severe pain in the lower abdomen which had begun about an hour before. At that time he was seized with severe abdominal cramps which came on at irregular intervals lasting two or three minutes, then subsiding, leaving a dull ache. Vomiting began shortly after the beginning of the seizure and continued. There had been a bowel movement on the day before. The patient gave a history of numerous similar attacks, although not so severe and lasting from one hour to a day and then subsiding. He generally vomits in the attacks, is constipated and has been relieved heretofore by catharsis.

Physical examination reveals a fairly well nourished but very pale young man. Heart sounds: Loud blowing murmur at the apex. Lungs negative. Abdomen rigid in lower half which is fuller than the upper half, especially upon the right side. There are no masses felt, nor any visible peristalsis noted. Rectus muscle becomes rigid on pressure and deep palpation brings on new attack of pain. White blood-cells, 7000; 75 per cent. polymorphonuclears. Urine negative.

After opening the abdomen the appendix was found to be apparently not inflamed, but there were some fibrous bands about the cæcum and adhesions.

December 12. The patient was awakened early this morning with such intense abdominal pain that he roused the whole ward with his yells. Enemas had no effect, and, the pain continuing, he was transferred to the surgical ward under my care and prepared for immediate operation, as acute intestinal obstruction was evident.

Operation, December 12, 11 A.M. As the lower half of the abdomen was distended and rather more so upon the left than upon the right side, a median laparotomy below the umbilicus was made and the cause of the obstruction sought. There was an escape of slightly blood-stained serum as soon as the peritoneum was opened, and a rapid search revealed a large mass in the lower abdomen which, being delivered into the wound, was found to consist of a loop of enormously distended small intestine which extended in a generally transverse direction across the lower abdomen. There was a distinct axial twist of the mesentery, which was unwound and the tumor found to consist of an intussusception of the small intestine, the intussusception being so tightly grasped that reduction by pressure was not to be effected. As the invagination had been of so short duration traction was made and the intussusception reduced, by a rather sharp jerk on the gut below the constriction. With the reduction of the last portion of the gut the cause of the obstruction became evident, as a tumor within the lumen of the portion of invaginated gut could easily be felt, and as this growth evidently pretty nearly obstructed its lumen a portion of the gut containing the tumor was resected and the ends of the gut were sutured together by end-to-end anastomosis.

The condition of the intussusceptum was good and with the exception of a few strings of fibrin upon the outer coat it showed no change as a result of the invagination. Wound closed and healing promptly occurred between the somewhat elongated appendix and the cæcum. The appendix was removed and the wound closed. The convalescence was interrupted by a severe attack of colic about the third day, but otherwise the patient progressed favorably and the wound healed per primam.

After remaining out about a month, the patient was readmitted on November 12, complaining of weakness, loss of strength in the lower limbs, and indigestion. After leaving the hospital he had resumed his work as clerk in an office and had remained four weeks, but finding himself growing rapidly weaker and unable to keep up with his work had come back to the hospital for treatment.

He has had palpitation and dizzy spells, occasional attacks of abdominal pain and eructations of gas, and sometimes nausea. Physical examination shows marked anæmia. Heart shows murmur as before described. Urine shows a faint trace of albumin. Abdomen soft, negative. White blood-cells, 8400; polymorphonuclears, 56 per cent.; lymphocytes, 18 per cent.; eosinophiles, 0 per cent.; red blood-cells, 3,592,000; hæmoglobin, 30 per cent. He was transferred to the medical division for treatment, November 16. On November 30 occult blood was discovered in the stools.

December 2. Gastric analysis practically negative. Free hydrochloric, 60 per cent. Total acidity, 105. Combined, 45. Blood positive, probably from tube.

X-ray examination on December 8, according to the radiologist, showed extensive periduodenal adhesions and fixation of pars pylorica and duodenum and hepatic flexure of the colon. Positive X-ray diagnosis of duodenal ulcer.

December 9. First seen by Dr. Hotchkiss in consultation with Dr. Norrie, as to the question of probable duodenal ulcer. Lenhardt diet ordered, as diagnosis seemed too doubtful to operate.

Post-operative Course.—The patient rapidly gained in flesh and strength and by January 7 his hæmoglobin had increased to 70 per cent., and he has had no further abdominal pain. He was discharged about three weeks later in good condition, able to enjoy the regular diet without discomfort and gaining weight steadily.

Pathologist's Report on Tumor.—Specimen examined consists of a piece of gut 60 mm. in diameter and 90 mm. in breadth. The valvulæ conniventes are fairly well marked. In centre of specimen there is a pedunculated tumor mass with a rather broad pedicle measuring transversely 33.3 cm. It thus occluded almost entirely the lumen of the small intestine. The serosa opposite the pedicle is thickened and the tissue is retracted through scar formation. Microscopically it is a typical adenomatous polyp. There is no evidence of malignancy.

This case is reported as a rare form of intussusception and it suggests at least a possible source of occult blood in the stools, also, perhaps, a possible cause of some cases of unexplained anæmias.

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, held April 3, 1916

The President, Dr. Charles H. Frazier, in the Chair

SUBACROMIAL BURSITIS, SHOWING RECOVERY FROM OPERATION

Dr. James K. Young exhibited a man, aged thirty-five years, referred to him by Dr. Thomas A. Erck, on account of a painful condition of the shoulder-joint. Eight months before the man had a fall from a height of 26 feet, and caught on something with his right hand, injuring the shoulder; since that time there has been noted severe pain in the shoulder-joint, especially beneath the deltoid muscle.

Examination showed considerable disability of the shoulder-joint, with inability to lift the arm shoulder high. The X-ray showed a shadow due apparently to a localized infiltration of the soft parts just below the tip of the acromion process on the right side. A diagnosis of subacromion bursitis was made, and the Codman operation was performed by him, following the technic accurately. An incision was made on point of shoulder about 2½ inches in length, extending down to but not beyond the centre of the deltoid, at which point the circumflex nerve winds around the neck of the humerus. The fibres of the deltoid were separated, the bursa was exposed and found to be adherent to the muscle, these bands were separated, the sac was opened and a white fluid evacuated; there was no calcification of the sac and no loose fragments of bone; there was one firm band of adhesion in the upper part of the sac which was divided. No deep sutures were used and the wound was closed with silk gut sutures. The arm was elevated to a right angle and suspended in bed for forty-eight hours; primary union occurred; four weeks later the arm was manipulated and massaged, and perfect recovery resulted.

The interesting features of this case were: (1) Prolonged and ineffectual treatment which he had for eight months before applying for operation; (2) the possibility of making a diagnosis from the X-ray in a bursa in which there was no calcification; (3) the simple character of and prompt recovery from the operation.

There are many such cases in every large orthopædic clinic, some are

simple without injury to the bone, and in some which he operated upon recently, there were fragments of bone lying beneath the bursa, which required attention after the bursa had been opened. It has been said that manipulation is more important in these patients than operation, but in this particular individual the operation seems to have been more important than the manipulation itself. It has also been stated that these patients recover within a given space of time without any operation, but in this particular individual there was no improvement whatever eight months after the accident and he was totally incapacitated for work. It has been a question whether time is shortened by operation, and it appears in this patient that the time was distinctly shortened by the operation.

Dr. Gwilym G. Davis said that Dr. Young's case of subacromial bursitis brought up the question of the advisability of operating in cases of disability in which restriction of motion of the shoulder-joint is present. He thought the disability to be due to the normal motion being restricted by effusion or contraction or by bands; and, if by some means the causes which limit the motion are eliminated, there will ensue a return of function. That being so, if these cases were treated by some method of persistent stretching, by some form of exercise, by free movement of the joint under anæsthetization; or, if the patients were put in bed and weight traction made to increase abduction, or by any means to obtain a normal range of motion, the symptoms will be eliminated. In these cases of disability the question arises as to whether or not the improvement is due to the operation itself. He was inclined to believe that the improvement is not due to the cutting part of the operation, but to the improved position in which the limb is placed after the operation is completed; in other words, to the freer motion and the placing of the arm during the process of healing in the most extreme position. If this be true, then the same result ought to be brought about by persistent conservative methods which will stretch the adhesions; or by radical movements under an anæsthetic, which will rupture or stretch adhesions and increase the range of motion, this to be followed by exercise of the parts.

Dr. A. P. C. Ashhurst said that he saw a great many stiff and painful shoulders, but it is impossible to secure hospital accommodations enough to operate on even a small proportion of them. He never saw but one patient that he thought he could certainly diagnose as a subacromial bursitis without other lesion, yet at operation on this patient, no bursa at all was present, but under the thinned deltoid he did find inside the capsule two osteophytes, which he removed; and the patient's

disability was completely relieved (ANNALS OF SURGERY, 1916, I, 174). If one could treat these patients with periarthritis of the shoulder in the manner Dr. Davis suggests, without operation but by persistent abduction in a plaster case, retained for from four to eight weeks, one might be able to cure them; but it is difficult to induce an adult patient to have his arm fixed so long in this position. Operative treatment, therefore, is not entirely to be condemned if it will get a patient well in a shorter time. He asked Dr. Young how long he kept the patient in bed, whether the time of treatment was lengthened or shortened by operation, and whether, if he had given an anæsthetic and instituted abduction and done no operation, he would not have kept the patient in bed the same length of time.

DR. DAMON B. PFEIFFER had been trying for some time to get some information regarding stiff and painful shoulders. He had been impressed with the uncertainty in the etiology of stiff and painful shoulders and with the lack of a definite underlying pathology. Dr. Ashhurst's case of a spur of bone which seemed to be the cause of disability reminded him of a case on which he operated about six months ago: a man fell into a hole, receiving an injury to the shoulder-joint; following the injury he had a very rigid shoulder, the arm could not be abducted to a right angle, and was almost without power. The man was under observation for two months, the X-ray showing absolutely nothing, but the patient's condition nevertheless demanded relief. There was a peculiar grating in the shoulder on motion which he attributed to subacromial bursitis. Making the usual incision, he found a small triangular gap in the capsule of the joint, evidently due to a rupture at the time of the accident. At the base of the triangle there was a rough protruding ridge of bone from which the capsule had been torn, and this gave the grating sensation by infringing upon the acromion. He attempted to close the defect, first chiselling away the bone and making it smooth, but was unable to do this because the tissue was detracted and dense. He then mobilized the capsule by undermining it and shifted it across in order to close the defect. A plaster dressing was applied and the arm kept in hyperabduction for four weeks. The arm was much improved when he left the hospital, but he had not been seen since. These cases emphasize the uncertainty of the underlying pathology prior to operation and the fact that here, as in the abdomen, the exploratory incision is justified in certain cases.

DR. T. TURNER THOMAS had seen the same condition described by Dr. Pfeiffer of a perforation in the joint capsule and overlying rotator tendons. It would seem to be due to the tearing away of the capsule

and the overlying tendons from the greater tuberosity to which they are attached. He thought the tearing away of the capsule with the fragments of bone gives the calcification that we hear so much about in connection with subacromial bursitis.

TUBERCULOUS AND LUETIC INFECTION OF KNEE-JOINT

Dr. James K. Young also reported a case of a youth fourteen years old suffering from mixed infection of the knee-joint—tuberculous and luetic. Three months before he first saw him he fell, striking his right knee, and acute inflammation and swelling occurred, and two weeks later he was taken to a large general hospital where he remained three weeks. He left the hospital because amputation was advised.

Examination at this time showed the right knee greatly enlarged, indurated and flexed to 10 degrees; the joint could be flexed but could not be extended. The family history was negative. The X-ray showed a large amount of periosteal inflammation with some enlargement of the bone; the disease did not extend into the cartilage of the knee-joint. The tuberculin test was positive and the Wassermann test was slightly positive. The limb was straightened by dividing the hamstring tendons and forcible correction under an anæsthetic. Subsequent to this operation an abscess formed and a sequestrum was removed. Later a circular seat brace was used to take the weight off the joint, and the limb was kept in an extended position. In addition to the mixed treatment he was given local applications of the X-ray. The result has been most gratifying, there is a complete restoration of all the movements of the joint and entire freedom from pain. The interesting feature of this case was the diagnosis which was confirmed by the Röntgen examination. The pathological condition present has to be distinguished from sarcoma. There was marked periosteal thickening in the negative taken four months after the onset of the disease, the striated appearance being characteristic of specific disease.

Specific osteomyelitis shows more sclerosis and less infiltrating destruction of the bone than occurs in acute pyogenic osteomyelitis.

In sarcoma the ossification progresses in an irregular and ragged way, the effect in the X-ray being not uniform but spotted quite different from the regular bony layers observed in chronic specific periosteitis. The exudate has a smoky appearance.

TOXIC GOITRE IN GIRL TEN YEARS OLD

Dr. A. W. Sawyer, by invitation, described the case of a girl, ten years of age, who was admitted to Dr. Frazier's service, University

Hospital, March 8, 1916, with a complaint of goitre and nervousness. She is a school-girl, ordinarily industrious and does well in her studies. She sleeps well, but gets easily tired and excited. She has had measles, mumps, pertussis and scarlet fever. She is subject to colds. Menstrual periods have not begun.

Father is an alcoholic and on many occasions had returned home in a drunken condition threatening to either turn the family out into the street or kill them all. Naturally, this has always greatly upset the child, and may be a possible etiological factor in her case. At present the father is suffering from tuberculosis at Mt. Alto, so that disturbing element in the family life is eliminated. The mother, four sisters and one brother are living and well. Two brothers are dead, one dying at birth, the other in infancy of unknown cause. Two aunts died of cancer of the breast and one of toxic goitre.

With reference to the present history, two years ago, patient developed shortness of breath upon exertion, and attacks of palpitation of the heart. At this time a swelling was noticed in the neck. Nervousness came on shortly after and dyspnœa, and palpitation gradually increased. For the past year and a half she has had pain about the heart which becomes marked upon exertion. This is not always severe, but it is discomforting. At times she is cyanotic upon exertion and for the past two years has had night sweats and becomes easily excited.

There is no cough or other symptom referable to the lungs. Appetite is poor and at times she suffers from indigestion. No vomiting. Bowels are regular. No difficulty in breathing or swallowing. No swelling of the ankles. Former headaches have been relieved by glasses. Mother stated that child was unusually thin and had no desire to work or play.

She was a thin, rather poorly nourished young girl, with flushed cheeks and watery eyes. Pupils were slightly dilated. They reacted to light and accommodation, there was no widening of the palpebral fissure, no exophthalmos or von Graefe sign. Voice was husky. Laryngoscopic examination was negative. Upon admission pulse ranged between 90 and 105.

Thyroid gland is moderately enlarged. Both lobes about equal. There was an expansile pulsation felt over the gland, also a slight thrill, and at times a bruit was heard. There was slight enlargement of the posterior cervical lymphatics. There was a marked systolic pulsation in the vessels of the neck and in the episternal notch, and a systolic murmur was heard in the carotids.

The chest was thin, lungs normal, except for the right apex, which

showed increased harshness of the breath sound both anteriorly and posteriorly with slight increase of vocal resonance. No whispered voice sounds or râles were heard.

Heart was slightly enlarged both to the right and left, muscular qualtity good. Rate was somewhat rapid and there was a marked respiratory arrhythmia. At the apex there was a soft systolic murmur and a harsh systolic murmur at the aortic area transmitted to the vessels of the neck.

Abdomen negative. Hands and feet were sweaty. There was no tremor and no œdema of the ankles. Reflexes normal.

With the exception of a slight trace of albumin, urine was negative.

Blood showed 18 per cent. of lymphocytes in the differential. Blood-pressure, systolic 114, diastolic, 48.

Fluoroscopic examination of the chest revealed no substernal thyroid or thymus. She was put to bed at once on routine anoci treatment in preparation for operation, which was performed twelve days later. During this time she improved but slightly.

Operation was performed by Dr. Frazier under anoci technic. Both lobes were found to be enlarged, but because of the child's age, it was thought wise to do only a single lobectomy. The right was removed, together with the isthmus as far as the left side of the trachea, leaving the posterior capsule behind. Wound was closed with drainage which was removed in twenty-four hours, stitches were taken out in seven days, wound healing by first intention.

Patient is making an uneventful recovery with gradual improvement in the symptoms. She feels better, is not so nervous and does not flush up as easily. Heart rate is about the same, although the chart shows that it has not reached the high points that it did previous to operation.

Blood-pressure, systolic, 108; diastolic, 68.

The signs which were present in the heart before operation have disappeared so that there are now no abnormalities. Electric cardiograph tracings made both before and after operation show a change in the temperature wave which might perhaps be taken to mean that the ventricular action of the heart is somewhat lessened. Blood picture is approximately the same as on admission.

Pathological report gives a diagnosis of colloid and exophthalmic goitre, the toxic hyperplasia being secondary.

Except as to the age of the patient the case was not an unusual one, but because it was the youngest case of goitre with which they had had to deal it was deemed worthy of note. Dr. Frazier has had one case of sarcoma of the thyroid in a boy of eleven years, and he recently saw a

girl of twelve years who had a non-toxic goitre of several months standing. In this case there was also an etiology of a drunken parent upsetting the nervous mechanism of the child.

The reporter referred to an article by Dr. Coleman Buford, of Chicago, in which he speaks of the condition as rather common. To be sure, Chicago is in a goitrous territory, and therefore many more goitres of all ages are seen.

Dr. Buford divides the cases into three groups: (1) Those of infancy under one year of age; (2) those of childhood from one year to adolescence; (3) those of adolescence.

In the first group, namely those under one year of age, he finds that they are not so frequent. He cites a case of an infant under one year at the Cook County Hospital, who had a goitre but this was accompanied by an enlarged thymus. Reference is also made to a case of goitre in a 6-months' fœtus, and he says that there are other scattered references through the literature of goitre in infants under one year. No reference was found in the pathological records of late years. Dr. Joseph B. DeLee has seen goitre present at birth, one in an infant born of a goitrous mother, in which the goitre was so large that the child's head was forced backward because of it. He says it is not uncommon for goitres to appear in children the second or third day after birth, and then in a few days to quickly disappear.

In the second group, namely from one year to adolescence, to which this case belongs, goitres occur with increasing frequency, according to Dr. Buford, and between six years and adolescence they are very numerous, at least in the region about Chicago.

They are usually goitres involving a well-defined area of the gland, and 9 out of every 10 will show the lesion in the lower pole of the right lobe. From this Dr. Buford assumes that possibly the thyroid gland has a division of function. They are usually benign adenomas with varying degrees of toxicity. Some are very toxic. Unilateral thyroidectomy is not often indicated. Usually, removing the encapsulated nodule or mass is sufficient, while the majority are benefited and relieved from symptoms by thyroid feeding, removal of focal infections, such as badly diseased tonsils, adenoids and teeth, and proper hygiene. He finds goitres often associated with diseased tonsils; the sort that look innocent enough until the pillar is pulled aside and the tonsil turned out of its bed.

The symptom-complex which he gives indicates a low grade of health and the case just recited falls under this list very readily. The children, mostly girls, are frail and thin with soft muscles

which easily fatigue. They are irritable, do not enjoy play and are slow in school. The eyes are usually bright and watery. No exophthalmos. Hair is gritty and dry. There is a faint flush of the cheeks, complexion is muddy and skin frequently shows eruptions. Extremities are cold and the pulse ranges between 80 and 120. The heart is tumultuous but shows no tachycardia in the usual sense. Occasionally fine tremors of the choreiform type are present.

No characteristic blood picture and no chlorosis. The history of this ten-year-old patient fits into this syndrome very well.

Out of about 3000 cases of goitre in the Mayo Clinic, 10 per cent. were under twenty years of age and only *five cases* were below ten years. The youngest was four, who showed a typical exophthalmic type. There were 3 cases of seven years, and one of eight. All were girls.

PERFORATION AT THE STOMA TWO YEARS AFTER A GASTRO-JEJUNOSTOMY FOR DUODENAL ULCER

Drs. George G. Ross and William B. Swartley reported the case of a man, thirty-three years of age, who was admitted to the Germantown Dispensary and Hospital, November 3, 1912, and discharged December 12, 1912, as improved. He presented the symptoms of duodenal ulcer, and was so greatly improved by dietetic treatment that he was discharged after five weeks.

He was readmitted to the surgical ward of the Germantown Dispensary and Hospital, January 27, 1913, in the service of Dr. G. H. Ross, stating that two weeks after discharge from the hospital his previous symptoms began to recur with increased severity. He treated himself as before in order to get relief, but the symptoms were so extreme that he returned to the hospital.

Operation (January 29, 1913).—The peritoneal cavity was opened by an upper right rectus incision, and an ulcer found on the duodenal side of the pylorus. A posterior gastrojejunostomy was performed and the pylorus was plicated and the abdomen closed in the usual manner. Patient had a satisfactory recovery from this operation and was discharged as cured on February 21, 1913.

He was again readmitted to the surgical ward of the Germantown Dispensary and Hospital on the service of Dr. Francis T. Stewart, April 28, 1915, with the following history: Three weeks after his second discharge from the hospital, he noticed a burning persistent pain in his lower abdomen just above the pubis. Diet and "Sprudel salts" gave relief. He would have a period of malaise, nausea and vomiting almost every month. The pain would often come on about one-half

to one hour after a heavy meal, and as a rule was accompanied by pain shooting to both shoulders. Most often he had a gnawing and burning pain on an empty stomach, most pronounced about 5 P.M. These symptoms continued; always has gas and an oily fatty taste upon belching and a great deal of "heart-burn." In the morning of April 28, 1915, he did not feel well and ate nothing, but took a dose of salts with temporary improvement. He carried a bucket of coal from the cellar and on his arrival upstairs he had a sudden, sharp, stabbing and cramp-like pain in his upper abdomen, most severe around the umbilicus, and soon becoming general. This pain was accompanied by cold sweats. The physician who saw him then said he had board-like rigidity of the entire abdomen and was greatly shocked. He did not vomit, but was nauseated. His bowels had been regular and three weeks before admission they were a tarry black color. When admitted the abdomen was somewhat distended and absolutely quiescent. Respiration was entirely thoracic. The abdominal muscles were in a condition of tonic rigidity. The entire abdomen was tender, but tenderness was most marked in the lower abdomen and at a point one and a half inches to the left and on a level with the umbilicus. This point was the location of the original pain. Some dulness in the flanks upon percussion but mostly in the left side. No audible peristalsis. Four or five hours after the initial pain, the abdomen was opened by an incision 2 cm. to the left and parallel to the previous incision. The belly wall was very thin. There were many adhesions to the old scar of the previous operation. On opening the peritoneal cavity, gas and free seropurulent fluid escaped. The adhesions to the old scar of the previous operation were so dense that examination to the right of the incision was impossible. The transverse colon appeared under the incision. This and the small gut were greatly inflamed. Search revealed a perforation to be on the jejunal side of the anastomosis and just at the point of anastomosis. The perforation was about 8 to 9 mm. in diameter and of a typical punched-out type. There was no suture material found at the site of the perforation. The perforation was invaginated with a purse-string suture of linen thread. A second suture of linen thread was used to reinforce and cover over the perforated area. A counter opening was made in the midline, midway between the umbilicus and the pubis, and a large rubber tube was inserted into the pelvis for drainage. Seropurulent fluid escaped from the pelvis. The wound was closed by layer suture and four tension sutures. One long piece of gauze drainage was allowed to remain at the lower end of the upper incision. The abdominal cavity was not flushed out with salt solution. Patient was placed in

the Fowler position and given proctoclysis. He was given nothing by mouth until the fifth day, when he had a few fluid drachms of albumin water. This was increased until he was given liquid diet without milk and soft diet on the tenth day. The rubber drainage tube in the pelvis was removed on the fourth day, while the gauze drainage in the upper incision was entirely removed on the seventh day after operation. All stitches were removed on the tenth day and the patient allowed out of bed in a wheel chair. The highest temperature was 102° F. on the day after operation. The temperature gradually returned to normal and remained so until the fifteenth day, when it rose to 101 4/5°. This temperature was reactionary, after shock due to a profuse hemorrhage from the bowel and stomach. After the bowel movement, which consisted almost entirely of blood, the patient fainted and was put back to bed, having all the symptoms of shock. After being returned to bed, he began vomiting large quantities of fresh blood. The bleeding was so severe that adrenalin chloride (1 to 1000) in two fluidrachms of water was given by mouth and morphine sulphate, gr. ⅙, by hypodermic. The vomiting of blood decreased gradually and after three days they again began to give patient water in small quantities by mouth and peptonized milk by rectum. On the eighteenth day after operation he was again given liquids, and on the nineteenth day allowed out of bed with no recurrence of complications. He was discharged as greatly improved on June 11, 1915. Since patient has returned to his home, he has been working regularly and has had very little pain in the stomach. After eating a big meal or after eating fried foods, he has had discomfort and vomited several times, but is now feeling better and has gained weight. Ten days after his discharge from the hospital the patient was married, and is now the happy father of twins.

Statistics show that jejunal ulceration occurs in 1.5 per cent. of all gastro-enterostomies. Keen states that all of these cases were of the perforating character, and therefore were not recognized, causing death by abscess, or in other ways in which adhesions and complications so obscured the parts that even an autopsy failed to reveal the true nature of the disease. Mikulicz says that in 34 instances in which the location of the gastro-enterostomy anastomosis was mentioned, it occurred 25 times by the anterior and 6 times by the posterior method. In the posterior operations the jejunal opening is about 9 inches distant from the beginning of the jejunum; in the anterior it is from 16 to 20 inches distant from this point. It would appear, therefore, that the lower the point of anastomosis in the jejunum, the more susceptible the mucosa to digestive action of the peptic juices.

The jejunal ulcer develops most frequently within the first six months following the original gastro-enterostomy. Of the 146 cases collected by Schwarz in 1914, 50 developed within this period, 22 within the second half of the year, 20 between the second and fifth years, and 13 between the fifth and tenth years. As a rule, the ulcer lies close to, and is exactly on the line of, the anastomosis, but sometimes it may be an inch or two away in the bowel, at either side of the anastomosis.

In 58 cases Van Roojen found the position to be:

In the closest proximity to, or exactly upon, the suture line in....	42
In the proximal limb of the jejunum in.....	6
In the distal limb of the jejunum in.....	8
In or near the point of an entero-anastomosis in.....	2

AMŒBIC ABSCESS OF THE LIVER

Dr. A. C. Wood had a paper with the above title, for which see page 335.

MESENTERIC THROMBOSIS

Dr. George M. Laws reported the case of a boy of ten years, who on January 1, 1915, was seized with acute abdominal pain soon followed by vomiting. He was taken home on a train by his mother and during the hour's ride went into collapse. A course of calomel was administered and followed by the passage of a large quantity of blood. A few hours later there were two small bloody stools. He continued to have severe colicky pains and vomiting and showed the effect of hemorrhage when seen by the reporter, four days after the onset, with Dr. H. L. Sinexon of Paulsboro, N. J. At that time the abdomen was moderately distended and decidedly rigid and tender, especially below and to the right of the navel. Peristalsis was increased. Rectal palpation revealed nothing except the presence of old blood. No attempt had been made to move the bowels since the first day. The patient had a tuberculous history and had never been robust. For several years he had often complained of abdominal pain in the early morning, for which no cause could be discovered. Three months before this attack he had swallowed a penny which was never found, but gave rise to no apparent trouble. He was removed at once to the University Hospital. On admission blood examination was: red blood-cells, 3,350,000; white blood-cells, 17,600; hæmoglobin 46 per cent.; differential polymorphonuclears, 86 per cent.; lymphocytes, 11 per cent.; leucocytes, mononuclear, transitionals 1 per cent.; temperature, 99. Pulse, 107. Respirations, 32.

Dr. Laws, with the assistance and counsel of Dr. J. B. Carnett, opened the abdomen by a right rectus incision; a considerable quantity of bloody fluid poured out of the peritoneal cavity. About two feet of the small intestines presented, distended, œdematous and purplish in color. The line of demarcation was fairly well defined at both ends. Delivery of the loop seemed to straighten out an obstructing kink at the distal end which, however, was regarded as secondary rather than the cause of the trouble. Below this point the intestine was collapsed. The mesentery was studded throughout with hard lymph-nodes of various size, evidently tuberculous. The mesenteric veins corresponding to the damaged segment were thrombosed. It was decided not to resect because of the well-known high mortality, the technical difficulties presented by the condition of the mesentery, and the fact that the gut was still viable after four days, and the patient had not grown progessively worse. The appendix was normal and was not removed. The wound was closed without drainage. The boy was very ill for two days. Vomiting then ceased and distention gradually subsided. After recovery he improved decidedly in general health and has had no return of the former abdominal pain, which was probably due to the tabes mesenterica and may have been benefited by exploratory laparotomy and subsequent treatment.

STREPTOCOCCIC PERITONITIS COMPLICATING ERYSIPELAS

Dr. Laws related the case of a man, aged nineteen years, who was admitted to the Phila. General Hospital, service of Dr. A. C. Wood, Feb. 19, 1916, with the following history. After a prodromal period of four days the patient developed a rapidly spreading facial erysipelas on February 16. At its height the temperature was 101° F.; the pulse 90. The duration was short and by the third day was rapidly subsiding. During the evening of February 17 he had slight pain over the splenic area, but did not call attention to it until the following morning, when it became worse. Abdominal examination was negative and an ice-bag was applied and the pain relieved. In the evening of the eighteenth he complained of pain in the region of the appendix. There was slight tenderness but no rigidity. Temperature 99; pulse 88. The next morning he began to vomit and had slight abdominal rigidity. Temperature normal; pulse 100. At 4 P.M. he had grown worse—temperature 97°, pulse 120, pain most marked over appendix. He was then sent to the hospital with a diagnosis of appendicitis. By evening he had general abdominal rigidity, tenderness and distention. Peristalsis was absent. Examination of the chest disclosed a pleural friction

at the left base and evidence of an inactive tuberculous process at the apex. Under the diagnosis of perforative peritonitis the abdomen was opened by a right rectus incision; free fluid, turbid and flaky, escaped. The appendix was partly covered with inflammatory lymph and was removed. It was not perforated and the fluid was odorless. A large quantity of fluid was present in the pelvis and in both flanks. Assuming that there was a perforation high up in the gastro-intestinal tract, the pyloric region, duodenum and gall-bladder were examined without one being found. A drain was placed in the pelvis and another in the right side. Temperature, pulse and respiration rose steadily until the patient died fourteen hours later. A culture made at operation showed streptococci.

Autopsy.—The intestines for the most part are smooth and shiny but many flakes of fibrin are scattered over their surface and several hundred c.c. of reddish turbid fluid occupy the dependent parts of the abdominal cavity. The appendectomy site is perfectly closed and in good order. There are no adhesions or other disturbances referable to the operation. The intestines were examined from end to end and showed no sign of perforation, nor did the stomach, duodenum, gall-bladder and other viscera. Both pleural cavities contain one hundred to two hundred c.c. of fluid, on the left side cloudy, and slightly blood stained; on the right side clear. The pericardial sac contains a normal amount of fluid. Heart negative. Left lung is attached to the diaphragm by a liberal coating of yellow fibrin. It is highly œdematous and there are scattered groups of minute miliary tubercles in the upper lobe. In the right lung the upper and middle lobes are œdematous. The lower lobe is solid, bright red, flabby, airless, and on section highly glazed and brilliant red, resembling the red hepatization of croupous pneumonia, but differing from it in not being swollen, friable or firm. The spleen is large and contains a considerable number of yellow infarcts of hæmatogenous and pyogenic origin, some on the surface and some deeply situated. The adrenals are quite œdematous, the cortical substance being yellow, the medullary substance bright red. The kidneys present the swelling of the cortex supposed to signify acute parenchymatous nephritis. Ureters, bladder and prostate normal. Duodenum and pancreas normal. Liver appeared normal, but cut surface was highly glazed and has a peculiar orange tint for which no explanation is apparent.

DISABLING MUSCULAR ANOMALY OF HAND

Dr. D. B. Pfeiffer described a case of supernumerary extensor of the digits which had interfered with the work of a pianist.

Dr. Addinell Hewson said this condition is very rare. The difficulty resembles, in a measure, the bridle between the middle, ring finger and little finger on the extensor tendon of the ring finger and proceeding to the two others named. This bridle prevents the act of trilling with the ring finger, when the middle and little finger must

hold the piano key down. The operation as done by the late Dr. W. S. Forbes of this city, in dividing this accessory tendon of the ring finger, has been reported in the literature. The fact, however, that it does give great relief in this mechanical movement of the pianist and flute player, is very evident. Quain's *Anatomy*, page 231, indicates the possibility of the occurrence of the fasciculi as outlined by Dr. Pfeiffer. It seems possible, from the attachment of this accessory muscle to the long extensor tendon, to divide its attachment to the long extensive tendon and thus relieve the bridle effect, or checking effect, upon the tendon in question.

TRAUMATIC SPONDYLITIS

Dr. L. W. Frank, by invitation, presented a man, aged forty-two years, who in May, 1914, tripped and fell, striking his back on a tree. The injury was not severe and he continued his work. That evening he noticed a small lump on his back which later practically disappeared. He could walk, and continued work, though at times he had slight pain in the back with neuralgic pains radiating around both sides of the abdomen. About four months later the pain in his back became quite severe, so much so that he could not lie down and had to sleep in a chair. Turning or twisting caused severe pain in the back radiating down the legs.

Eight months after the accident, the pain was so severe he could not move. He remained quiet for two months, spending most of his time in a chair, after which he got up and wore a brace. Since then he has gradually improved. At present he has no pain while lying down but the slightest jar or twist produces very severe pain in the back radiating down both legs, and he still has neuralgic pain radiating around his abdomen. He has no paræsthesia in the legs or abdomen. Since the accident he has had gradual loss of sexual desire and power. Since the accident patient has had swelling of the right leg which develops during the day and diminishes at night. At times the leg becomes very large indeed. There have been no gastro-intestinal or pulmonary symptoms.

Examination reveals a thin, stoop-shouldered man who holds himself quite rigid, though he has some tendency to bend forward. He walks slowly and with great care. The spine of the twelfth dorsal vertebra is prominent and quite tender to pressure. Below this level there is slight curvature of the spine to the left, and the spine is held rigid and immobile. Above this point the vertebræ are movable. The patient cannot stoop over, and when picking objects off the floor he does

so by flexing the thighs and knees. There are no sensory disturbances in the back, abdomen or legs. Both knee-jerks and Achilles jerks were slightly exaggerated. There is no Babinski nor ankle clonus.

The rest of the examination is entirely negative. Urine analysis is negative. Blood count reveals 5,000,000 red blood-cells with 75 per cent. hæmoglobin and normal leucocytes and differential count. Wassermann is negative. Von Pirquet is negative at the end of thirty-six hours. X-ray reveals bone destruction in the lumbar and lower thoracic vertebræ, with curvature and ankylosis of the lumbar spine.

This case conforms with the 3 points characteristic of traumatic spondylitis or Kümmel's disease. First, the injury. Second, period of practical freedom from pain during which neuralgic pains are frequently present. Third, reappearance of the pain with development of cord symptoms and kyphosis.

The only condition from which this disease must be differentiated carefully is Pott's disease. This differentiation is extremely difficult to make. In Pott's disease there is frequently a history of trauma followed later by pain in the back, kyphosis and ankylosis. However, in Pott's disease often other foci of tuberculosis are found, and this condition is more frequently found in children than in adults. The radiogram cannot aid very much in making a differential diagnosis in our case, as the condition had gone on to ankylosis and the X-ray picture of this case cannot be differentiated from that seen in old Pott's disease.

In 1891, at the Congress at Halle, Kümmel described a condition which he called traumatic spondylitis. This condition is always caused by trauma to the spine, either direct or indirect, producing a compression of the vertebral body. At the time of the trauma, patient experiences some pain in the spine, but later this disappears for days, weeks, or months, though in some cases it persists from the time of the trauma, gradually becoming worse. Several weeks or months after the accident, the patient again suffers pain in the back, accompanied by intercostal neuralgia, motor disturbances, sometimes slight in the lower extremities, with some uncertainty of gait. Later he develops a gibbosity and an associated kyphosis.

Kümmel does not attribute the condition to a fracture of the body of the vertebra for the trauma is always too slight to produce that. He considers that as a result of the trauma there develops a disturbance of nutrition (rarefying osteitis) which leads to atrophy of the two surfaces by compression ulceration. Kümmel considered such cases to be types of traumatic spondylomalacia. Similar cases have been

described by Henle, Heidenhain, Schultze and others, and in 1910 Mme. Temkin was able to collect 64 such cases.

DR. A. P. C. ASHHURST said that in the second volume of the *Episcopal Hospital Reports* (1914) his assistant, Dr. R. L. John, has recorded several cases of traumatic spondylitis. In these cases the diagnosis was based upon the fact that the original injury was very severe, causing the patient to come to the hospital and be laid up for some time. The first patient had fallen out of a third story window, landing on his feet. The second patient put his head in an elevator shaft and the elevator came down on him. The third patient fell nine feet from a ladder, landing on his head. The fourth patient was knocked down by a trolley car. The subsequent disability developed gradually weeks or months after the original injury, and it was necessary to exclude tuberculosis and syphilis as possible factors in the etiology. In the fourth patient, with disease in the lumbar region, about two years after bone transplantation was done for the kyphos which gradually resulted from his traumatic spondylitis, he developed a gumma following another recent injury over the former site of the disease. Though there was no history of syphilitic infection, he had a plus four Wassermann, but that did not change the opinion that the original trouble was traumatic spondylitis, the syphilitic infection being independent. He had been entirely relieved of his spinal symptoms since the operation, and the appearance of the gumma did not cause them to return.

It is a well-known fact that following a single severe traumatism one may get bone atrophy, as is especially seen in fractures of the neck of the femur, which almost universally terminate in shortening even when bony union occurs, and it is quite reasonable to suppose that a severe injury in the vertebral bodies, even without fracture, will produce bone atrophy also. In the cases observed in the cervical spine (Cases II and III), in which region the vertebral bodies are of insignificant size, the bone changes have been confined chiefly to the articular processes, where apparently most of the injury had spent itself.

ENDOTHELIOMA OF THE SPINAL CORD

DR. CHAS. H. FRAZIER reported a case of endothelioma removed from the spinal cord at the level of the second cervical vertebra. A lady in her sixty-fourth year, first complained of pain in the right shoulder eighteen months before her admission to the University Hospital. The initial period of root irritation continued eight

months before the second period was introduced with numbness of the right fingers and hand, and two months later weakness at first, and later complete paralysis of the right upper extremity. The examination elicited, briefly, tenderness in the neighborhood of the third cervical vertebra, spastic paralysis and sensory disturbances of the right upper extremity, paræsthesia of the left arm and leg, total loss of sensation for touch, pain and temperature in the left leg, and partial loss in the right; spasticity of both lower extremities and weakness of right leg and ankle. The biceps and triceps reflexes were exaggerated, and there was ankle clonus and a Babinski reflex on the right side.

The operation, performed under local anæsthesia, included the removal of the second, third, fourth and fifth spinous processes and the laminæ of the second, third and fourth cervical vertebræ. The tumor, when exposed, in the upper portion of the exposed canal, appeared at first to be intramedullary, but when an enveloping membrane, possibly the pia, was removed, the tumor was found to be extramedullary, attached to the dura, from which it probably originated. The cord was displaced to one side, and appeared to be reduced to one-half its normal diameter. The tumor was removed by sharp dissection, and with it one sensory root, which, surrounded by the growth, had to be sacrificed. The wound was closed with five layers of sutures, one each in the dura, muscles, aponeurosis, superficial fascia and skin. Convalescence was uneventful and by the time the patient left the hospital, thirty-five days after the operation, some power had already returned to the paralyzed arm and the patient could stand and walk with a little support. The interesting features of the case were the characteristic history, the accurate localization, the unusually high location of the tumor, the uneventful recovery, and the rapid restoration of function.

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